PROVINCE OF MANITOBA

DEPARTMENT OF HEALTH AND PUBLIC WELFARE

FEBRUARY 1929

REPORT ON THE POLIOMYELITIS EPIDEMIC IN MANITOBA — 1928

By

THE MEDICAL RESEARCH COMMITTEE
OF THE UNIVERSITY OF MANITOBA

WITH APPENDICES ON THE METHODS OF CONTROL EMPLOYED.

REPORT NUMBER 1
OF THE
DEPARTMENT OF HEALTH AND PUBLIC WELFARE

PUBLISHED AT THE REQUEST OF THE
MINISTER OF HEALTH AND PUBLIC WELFARE
BY
THE GREAT-WEST LIFE ASSURANCE COMPANY.
WINNIPEG — CANADA.

PROVINCE OF MANITOBA

DEPARTMENT OF HEALTH AND PUBLIC WELFARE

FEBRUARY 1929

REPORT ON THE POLIOMYELITIS EPIDEMIC IN MANITOBA — 1928

By

THE MEDICAL RESEARCH COMMITTEE
OF THE UNIVERSITY OF MANITOBA

WITH APPENDICES ON THE METHODS OF CONTROL EMPLOYED.

REPORT NUMBER 1
OF THE
DEPARTMENT OF HEALTH AND PUBLIC WELFARE.

PUBLISHED AT THE REQUEST OF THE
MINISTER OF HEALTH AND PUBLIC WELFARE
BY
THE GREAT-WEST LIFE ASSURANCE COMPANY.
WINNIPEG — CANADA.

TABLE OF CONTENTS

FOREWORD

BY C. C. FERGUSON, GENERAL MANAGER, THE GREAT-WEST LIFE ASSURANCE COMPANY

The Great-West Life Assurance Company is privileged in being permitted to publish the following reports regarding the outbreak of Infantile Paralysis which occurred in Winnipeg and Manitoba during the Summer and Autumn of 1928. The epidemic naturally excited great alarm and in view of the lack of knowledge regarding the nature of the transmission of the disease from one individual to another, and as to the best means of guarding against contagion, no family residing in the affected area felt safe. Naturally the parents suspected infantile paralysis every time a child showed any vague symptoms of ill-health, and physicians were themselves uncertain of their diagnosis in many cases. Accordingly in preparing statistical records care must be taken to exclude cases of illness which were probably not infantile paralysis.

The reports show that during a period of four and one-half months, from July 1st to November 15th, there were 435 cases of infantile paralysis in the Province. Of these 302 were in Winnipeg or its suburbs. The deaths numbered 37, being about 8½ per cent of those who contracted the disease. The reports do not show how many there were out of the total 435 cases who entirely recovered or how many were left with residual paralysis.

However, one of the reports does show a complete analysis of the results in 161 definite cases which were specially observed. Of these cases, 17 died, 54 were residually paralysed and 90 made complete recovery. Serum was administered to 74 of these patients in the preparalytic stage and of these none died while only 5 showed residual paralysis. Where serum was not administered until after onset of paralysis, the ratios of death and residual paralysis were very high. The hope is expressed that of those showing some residual paralysis a number will fully recover in the near future.

The reports show that the disease was more prevalent among males than among females. This fact, however, cannot be considered of special significance.

Unfortunately very little can be inferred from the reports as to the mode of transmission of the disease, whether by way of food, air or otherwise, but that the disease is transmitted from one individual to another by some medium or media is reasonably clear and it also seems safe to infer that the onset of the disease occurs from five to seven days after the patient has been exposed to contagion. A number of cases are reported where two members of the same family developed symptoms within a day or two of each other. In such cases it is probable that the patients did not contract the disease from one another, but from some source to which there had been a common exposure some days earlier.

Until some further facts are known about infantile paralysis, until the contagion is better understood and the germ is isolated, the disease will continue to be a dreaded one. The comparative helplessness of parents to protect their children from exposure induces a period of great anxiety when the disease becomes epidemic in the community. However, the splendid results obtained from the use of serum, if administered in time, are most hopeful and reassuring. But with respect to infantile paralysis, as with all other diseases, the main thing is that there should be no neglect of early symptoms. If treatment is undertaken in time by a qualified physician a cure is very likely to ensue. The only safe rule for parents to follow, when an epidemic of any kind is prevalent, is to call in a physician as soon as any untoward symptoms are observed. If the medical man finds, as he frequently will, that the disturbance to health is only of a trivial character, the relief that will ensue will more than repay the parents for their watchfulness and care.

The committees which organized the fight in Manitoba against the 1928 outbreak of infantile paralysis are to be highly congratulated on the efficiency of their efforts. Perfect team-work was displayed and much valuable research was undertaken. The community is greatly indebted to them for their part in combatting the disease and it is felt that the reports now presented will add considerably to the sum of scientific knowledge of the subject.

January 16th, 1929.

The Hon. Dr. E. W. Montgomery,
Minister of Health and Public Service,
The Legislative Building,
Winnipeg, Man.

DEAR DR. MONTGOMERY,

I transmit herewith, on behalf of the Medical Research Committee of the University of Manitoba, the Report of the Manitoba Epidemic of Poliomyelitis of 1928.

The report is composed of the following five papers:

1. The organization of the work concerned with the preparation and distribution of convalescent serum and the investigation of its action during the Manitoba Epidemic of Poliomyelitis, 1928

By C. R. GILMOUR, M.D., AND A. T. CAMERON, D.SC.

2. The distribution of cases in the Manitoba Epidemic of Poliomyelitis, July-October, 1928

By MARY MCKENZIE, M.D., GORDON BELL FELLOW OF THE COLLEGE OF PHYSICIANS AND SURGEONS, A. T. CAMERON, D.SC., AND A. J. DOUGLAS, M.D.

3. The preparation of convalescent serum for the Poliomyelitis Epidemic in Winnipeg, 1928

By FRED CADHAM, M.D.

4. The results of convalescent serum therapy in acute Poliomyelitis in the Manitoba Epidemic, 1928

By J. M. McEACHERN, M.D., BRUCE CHOWN, M.D., LENNOX G. BELL, M.D., AND MARY McKENZIE, M.D., GORDON BELL FELLOW.

5. Summary of Symptomatology and Laboratory Findings in acute Poliomyelitis in the Manitoba Epidemic, 1928

By J. M. McEACHERN, M.D., BRUCE CHOWN, M.D., LENNOX G. BELL, M.D., AND MARY McKENZIE, M.D., GORDON BELL FELLOW.

WITH AN APPENDIX ON

The Pathology of the Epidemic

By WM. BOYD, M.D.

The Committee venture to express the hope that should their research work in connection with this epidemic be considered of value, they may again be invited to co-operate by scientific investigation in similar emergencies.

I am,

Sincerely yours,

C. R. GILMOUR,

Chairman, Medical Research Committee, University of Manitoba

REPORT OF THE MEDICAL RESEARCH COMMITTEE OF THE UNIVERSITY OF MANITOBA

On

THE MANITOBA EPIDEMIC OF POLIOMYELITIS OF 1928

I

THE ORGANIZATION OF THE WORK CONCERNED WITH THE PREPARATION AND DISTRIBUTION OF CONVALESCENT SERUM AND THE INVESTIGATION OF ITS ACTION DURING THE MANITOBA EPIDEMIC OF POLIOMYELITIS, 1928

By

C R GILMOUR, M D , CHAIRMAN AND A T CAMERON, D SC ,
SECRETARY OF THE COMMITTEE

THE ORGANIZATION OF THE WORK CONCERNED WITH THE PREPARATION AND DISTRIBUTION OF CONVALESCENT SERUM AND THE INVESTIGATION OF ITS ACTION DURING THE WINNIPEG EPIDEMIC OF POLIOMYELITIS 1928

By

C. R. GILMOUR, M.D., and A. T. CAMERON, D.Sc.,
CHAIRMAN SECRETARY
Medical Research Committee, University of Manitoba

AUTHORIZATION. At a meeting of the Board of Health on August 16th, 1928, it was decided that the Medical Research Committee of the University of Manitoba should be authorised to prepare a convalescent serum for use in the treatment of Poliomyelitis and that the investigation of the present epidemic as to etiology, clinical course, and treatment should be undertaken by the Committee, and that the Board of Health should delegate to the said Committee all matters connected with the scientific aspect of the problem.

This resolution was communicated verbally at that time to the Secretary of the Committee and confirmed subsequently by a letter from the Hon. Dr. F. W. Montgomery, Minister of Health and Public Welfare, to the Chairman of the Committee, in which letter it was stated further that the Board of Health would be responsible for the necessary financial outlay, and would be pleased to co-operate at all times with the Committee.

RESPONSE. The Committee met on Friday, August 17th, Dr. Cadham being present by invitation. The following resolution was passed: That the Committee will attempt to obtain and handle supplies of poliomyelitis serum and make regulations for their proper use and the interpretation of results, working in conjunction with the Professor of Bacteriology.

At a further meeting on August 30th a sub-committee was appointed to carry on the work with full powers. This consisted of Dr. C. R. Gilmour (Chairman), Dr. F. T. Cadham, Dr. J. M. McEachern, Dr. Bruce Chown, and the Secretary.

The sub-committee subsequently met the Minister of Health,

Hon. Dr. E. W. Montgomery, and the City Health Officer, Dr. A. J. Douglas, on that evening, and discussed the work already done, and the general scheme of work to be done.

It was decided, with the approval of Dr. Montgomery and Dr. Douglas, to request the Superintendent of the King George (Municipal) Hospital that permission be granted for the placing of a nominee of the Committee in that Hospital to carry out accurate clinical observations on Poliomyelitis cases there.

The work accomplished is outlined in the rest of this Report and the accompanying Reports.

DISCHARGE. On November 9th the Secretary wrote the Minister of Health as follows: "I enclose herewith a copy of the last report mailed today to Dr. Douglas. You will see that the demand for serum has practically ceased. We have still over a dozen bottles in hand and serum is being prepared less than once a week. It may even be unnecessary to prepare more.

"We desire, if it be now considered feasible, to cease to be responsible for the preparation and distribution of serum, as the staff of the laboratory should as soon as possible be transferred to its ordinary routine research work.

"Would you please, therefore, instruct us as to what procedure you wish carried out."

The following reply, dated November 15th, was received from E. M. Wood, Esq., Secretary of the Provincial Board of Health:

"At a meeting of the Provincial Board of Health held on the 13th instant, I was directed, on behalf of the Board, to express to you their thanks and appreciation for the very valuable research work rendered by you respecting poliomyelitis, and to say it is with regret that your request to be relieved from further responsibility in the premises is concurred in.

"The work in future will be carried out by Dr. F. T. Cadham, Provincial Bacteriologist."

On November 15th the serum then in the hands of the Committee was transferred to Dr. Cadham.

ORGANIZATION

INVESTIGATION OF CASES. Dr. John M. McEachern and later Dr. Bruce Chown, acted as honorary consultants for the Committee, investigating all suspected cases on request of the patient's physician,

advising as to suitability for serum treatment and, when requested administering the serum

As soon as Dr Mary McKenzie, newly appointed Gordon Bell Research Fellow of the College of Physicians and Surgeons of Manitoba commenced her duties on September 4th, she assisted in this work and later, with the help of Mr E H Botterell fourth year student of Medicine, she undertook the greater part of it and actually administered serum in a large proportion of the cases submitted to her (The loan of a car by Lady Nanton through Mr Botterell much facilitated the rapidity with which this work could be accomplished the cases being widely scattered throughout the city and suburbs)

Dr Dugald McIntyre acting-Superintendent of the King George Municipal Hospital was requested to permit Dr Lennox G Bell to act as honorary interne at this hospital in order to make an accurate clinical study of the cases there Permission was granted and Dr Bell acted in this capacity from September 1st to October 10th inclusive, subsequently making frequent visits until November 1st His time rapidly became so completely occupied that it was necessary to provide him with assistance and through the courtesy of the authorities of the Winnipeg General Hospital, the services of an interne Mr S E Turvey were made available he assisted Dr Bell at the King George Hospital from September 14th until September 30th inclusive Fortunately the large number of available beds at this hospital permitted such a concentration of cases as rendered this study not only possible but peculiarly profitable

Cases treated with serum and not in hospital were re-examined at a later date This work was in large part carried out by Dr McKenzie During the week of September 17th her time being fully occupied with other duties through the kindness of the Sister Superior of St Boniface Hospital the services of an interne of the hospital, Mr David Christie, were lent for this work

Following the routine established in earlier epidemics elsewhere the consultant carried equipment which permitted expeditious examination and immediate injection of serum when this was considered desirable This equipment consisted of

(a) Thermometer and percussion hammer (b) (for lumbar puncture) iodine 95 per cent alcohol absorbent sponges, sterilised lumbar puncture needles, test tubes local anaesthetic (1-2 percent

novocaine) sterilised syringe and needles for local anaesthetic C. and E. mixture, and anaesthetic mask, (c) (for cell count and globulin estimation) white blood cell pipette, diluting fluid (gentian violet glacial acetic acid, and water), Fuchs-Rosenthal counting chamber microscope, and Pandy's fluid and (d) (for administration of serum) vials of serum for intramuscular and intravenous injection sterilized syringes and needles, and tourniquet. (In addition, in a large proportion of the cases further examination of the spinal fluid colloidal gold curve determination was carried out for the Committee by the Pathological Laboratory of the Winnipeg General Hospital.)

ADMINISTRATION OF SERUM. The parents of all minors to whom serum was administered by members of the Committee were required to sign the following form:

I,_____, of the City of Winnipeg in Manitoba, father (mother) of_____ hereby consent to the administration of convalescent serum to the said_____, by the method approved by the Medical Research Committee of the University of Manitoba.

Dated at Winnipeg, the_____ day of_____ 1928.'

Appropriate alterations were made for non-residents of Winnipeg, and for guardians.

DONORS FOR SUPPLIES OF SERUM. Serum is obtained from the blood of individuals who have previously suffered from Poliomyelitis.

The Health Department of the City of Winnipeg had available a fairly complete list of previous cases of poliomyelitis that had occurred in the city. Nevertheless it was found extremely difficult to trace many of these presumptive donors, since some had left the city, others had changed their addresses, and in other cases no sufficiently definite medical verification of the disease could be obtained. A certain number of individuals were reached, however, sufficient to meet the early demands for serum. (Dr. Angus Murray, of the Shriner's Hospital, gave valuable assistance at this time in obtaining donors.)

Soon these donors had to be called upon to give blood a second time.

Donors were paid at the rate of $5.00 for 50 c.c. of blood or less, and $10.00 for more than 50 and less than 100 c.c. of blood. Larger amounts taken in a few cases were paid for at corresponding rates.

As soon as the demand for serum commenced to increase the sub-committee faced a possible shortage of donors. It was resolved therefore, to explore every possible channel to obtain more serum Private information in the possession of members of the committee indicated that it would be useless to approach authorities in the larger eastern cities of the United States since e.g. in New York, all available serum was being used.

Successive efforts were made to obtain serum from Edmonton (September 1st), Toronto (September 3rd), and Trail, B C. (September 4th) in each case replies to telegrams sent suggested that there must be such a delay before serum could be received that the next request seemed justified

Serum was not available from Edmonton until our local Winnipeg supply was large enough to meet requirements, and since Dr Mewburn of the Provincial Department of Health at Edmonton desired to retain this for use in Alberta unless it was urgently needed in Winnipeg, none was sent

Through the co-operation of Dr Alan Brown and his assistants, Dr J G Fitzgerald and his staff of the Connaught Laboratories were able to send 35 ten c c vials of serum which reached Winnipeg on September 8th. Even this prompt response however would have meant many refusals of demands for serum had we been unable to obtain earlier than this, larger local supplies

Through the kindness of Dr Basted seven tubes of blood were obtained in about 10 days from Trail B C. Although these were beautifully packed on ice, a slight degree of haemolysis had taken place so that the serum was tinged with haemoglobin Dr Cadham advised that this serum should not be used except in emergency (and subsequent to this stage such emergency did not arise)

On September 4th it was agreed that the Manitoba Free Press and the Winnipeg Tribune should be asked to publish the following note, leaded, on their front pages

BLOOD URGENTLY NEEDED

Former cases of infantile paralysis who are willing to give a little blood to assist in the treatment of the disease, are requested to phone the Medical Research Committee phone 26-923 The procedure is simple and there is no risk to the person giving blood All such donors will be remunerated.

This was published in these papers next day and gave immediate results A large number of donors were obtained, and these sent others, and subsequently no shortage of donors was experienced

In all 113 donors were used 201 times. Of these 56 were used once only 40 twice, 9 three times, 3 four times, 4 five times, and 1 six times Ten cases from the present epidemic were used in all fifteen times. Three cases were each used a single time that had occurred 30, 31 and 33 years before The average period since the disease was 12 years Practically all the serum was pooled

Blood was taken from the donors by the technician-nurses of the Gordon Bell Research Laboratory and the Department of Biochemistry, following a rigid technique laid down by Dr F T Cadham The parents of donors who were still minors were required to sign the following form

I, , of the City of Winnipeg in Manitoba, father (mother) of , who suffered from Poliomyelitis in , hereby consent to the withdrawa of blood from the said by, , acting on behalf of the Medical Research Committee of the University of Manitoba for the purpose of preparation of a serum for the treatment of acute Poliomyelitis

Dated at Winnipeg the day of ,928.

In spite of the length of the epidemic in Winnipeg very few of the cases of 1928 could be employed as donors.

The Committee draw the following conclusions from their endeavors to obtain serum

Since it is essential that serum be obtained in the pre-paralytic stage of the disease if it is to be of service

1 *Each community must depend upon its own supply of donors Lists of such donors should be kept by the health authorities, and should be periodically checked and their addresses kept up to date*

2 *While where the local number of donors is likely to prove inadequate it is the obviously correct procedure to endeavour to obtain serum from outside sources yet such serum cannot be expected in less than a week and probably not in less than ten to fourteen days after request for it nor unless some routine machinery has been set up at the point of supply can a continuous supply be reasonably requested. Moreover, such other community never knows at what moment local demand may occur*

3 *The newspapers of a community can, as in Winnipeg, be of the utmost service in obtaining donors in such emergencies, and can, if they desire to co-operate properly as they did in Winnipeg carry out this service without unduly exciting public anxiety*

4 *Donors must be paid The rate of payment that we have made, based on rates paid for larger amounts of blood for transfusions seems to be sufficient*

5 *Sufferers in an epidemic, even if it be prolonged cannot be relied upon to be of much assistance in furnishing blood for the preparation of serum during that epidemic*

6 *Blood however carefully packed, cannot be sent any distance Only serum can be usefully shipped*

DISTRIBUTION OF SERUM

Since the use of serum was still in the experimental stage, and since no previous local test of its efficiency had been made, the Committee, while believing in its use, did not feel justified in doing more than attempting to meet every demand for it by the physicians of the City of Winnipeg and the Province

EVERY DEMAND HAS BEEN MET During August the demands were not many This was in one way fortunate for the Committee's work, since at that time the activities of its laboratory were suspended the new Gordon Bell Fellow having not yet taken up her duties. the technician-nurse being away from Winnipeg on vacation. and the other laboratories of the Medical College being similarly depleted

Supplies of serum were prepared by Dr Cadham and his assistants in the Provincial Laboratory, sufficient to meet demands

After the emergency meeting of the Winnipeg Medical Society on Thursday August 30th, dealing with every aspect of the disease, demands for serum increased.

On September 4th the Committee established a 24-hour service in its laboratory for the issue of serum, night duties being undertaken by Mr E H Botterell and day duties by the technicians of the laboratory and the Department of Biochemistry, with occasional relief during the evenings by Dr McKenzie and Dr Sara Meltzer of the Pathological Laboratory of the Winnipeg General Hospital This service proved very useful, since a large proportion of the calls

for serum were during the late evening or especially (long distance calls) during the first hour or two after midnight

When the demands for serum commenced to abate, which fortunately coincided with the opening of the winter session of the Medical School, arrangements were made by which night calls for serum were switched to Dr McEachern's residence (commencing September 30th) where a supply of serum was deposited and renewed from time to time to meet such demands. As has already been stated, the laboratory ceased to issue serum and handed over the stock in hand to Dr Cadham of the Provincial Laboratory on November 15th

SERVICE TO THE CITY AND SUBURBS. When the symptoms of a patient were definite or strongly suggestive of poliomyelitis in the pre-paralytic stage, serum was given to the attending physician on demand, although if possible a spinal fluid count was requested before administration of serum

When requested in the earlier weeks Dr J M McEachern and Dr Bruce Chown, and later on, Dr Mary McKenzie confirmed the diagnosis, made a spinal fluid count and injected serum

SERVICE TO THE COUNTRY This in the nature of things, could not be carried out so rapidly

In a few instances physicians or parents of patients within a 100 miles radius motored in and took out serum with them

Immediately on receipt of long distance calls, whether received directly or through the Provincial Board of Health, in all cases where there was the least suspicion of poliomyelitis, serum was despatched by the quickest route.

Assistance was received from officials of the railway companies in several ways. In some instances conductors took personal charge of serum, and in one or two instances trains were stopped specially at points of delivery

Nevertheless in many instances there was an unavoidable time interval of 24 hours or more between receipt of request and receipt of serum. This may, in some instances, have rendered its employment valueless.

It seems difficult to suggest means of overcoming such delays. The distribution of cases throughout the province was much too irregular to warrant creating depôts of serum at different points,

nor was the amount of serum available at any time sufficiently large to warrant indefinite amounts being sidetracked at such depôts and uncontrolled centrally

In a large number of the country cases, however according to reports received, the serum did arrive in time to be of service

TOTAL ISSUE OF SERUM Before September 4th somewhat more than 14 vials were issued from the Provincial Laboratory (the 14 vials contained in all 350 c c of serum)

From September 4th to November 15th the following vials were issued through the Gordon Bell Laboratory

	City and Suburbs	Rest of Province	Kenora, Ont.	Golden, B.C	Sask	Total
Winnipeg Serum	255	66	4	2		327
Toronto Serum	7	6			6	19

The average content of the vials of Winnipeg serum was 25 c c , the total issue during this period being therefore 8175 c.c Of this issue 8 vials that were sent to the country were returned after some time, but could not again be utilised.

Of the Toronto serum (10 c.c vials) 190 c c were used

NUMBER OF CASES TREATED WITH SERUM.

	Definite cases of Poliomyelitis	Cases that appeared probable but later were considered not Poliomyelitis
City	117	16
Suburbs	24	6
Rest of Province	28 plus	4
	169 plus	26

The records received through the Provincial Board of Health frequently do not indicate whether serum was employed, and many of our forms sent with serum and asking for information were not returned The majority of the 66 vials sent out throughout the Province were used, and between 40 and 50 cases must have been treated A certain number of cases given serum at the King George and St Roch's hospitals were from outside Greater Winnipeg

Fifteen cases at the King George Hospital received Pettit's serum, supplied by the Pasteur Institute of Paris. on receipt of a cable from Dr Bruce Chown. Certain of these cases received convalescent serum in addition. These have not been included in the above list

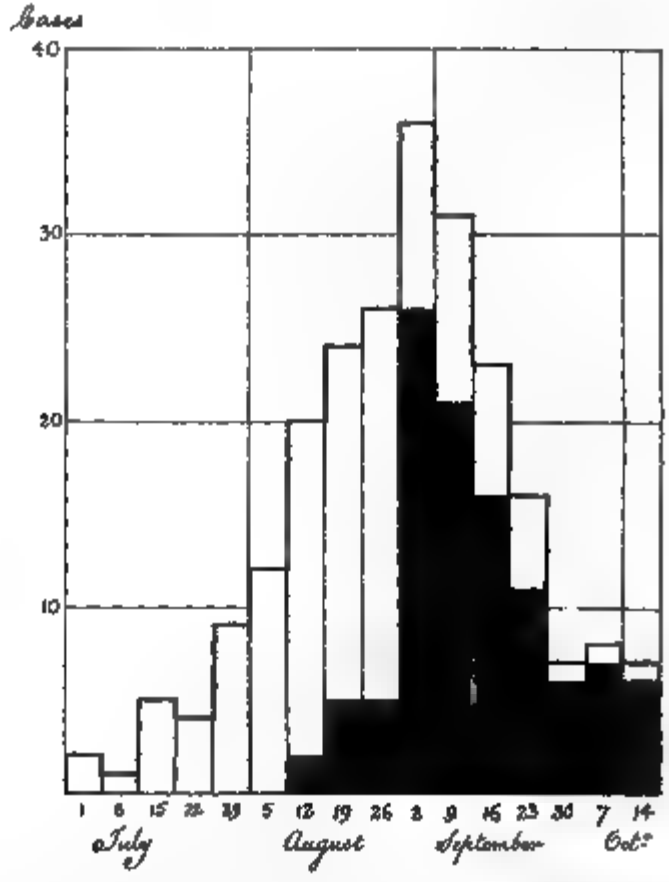


Fig 1 Cases of Poliomyelitis week by week in the City of Winnipeg The blackened areas indicate cases treated with serum.

The cases treated with serum belonging to the City of Winnipeg, contrasted with the total number of cases in that area, are shown from week to week in Figure 1

PATHOLOGY

Dr William Boyd Professor of Pathology in the University of Manitoba, was asked by the Committee to co-operate in studying the pathology of cases that went to autopsy His report is attached as an appendix to that on symptomatology

II

THE DISTRIBUTION OF CASES IN THE MANITOBA EPIDEMIC OF POLIOMYELITIS, JULY-OCTOBER, 1928

By

MARY MCKENZIE, M D , GORDON BELL FELLOW OF THE COLLEGE OF PHYSICIANS AND SURGEONS, A T CAMERON D SC , AND A J DOUGLAS, M D

THE DISTRIBUTION OF CASES IN THE MANITOBA EPIDEMIC OF POLIOMYELITIS, JULY-OCTOBER 1928

By

MARY MCKENZIE, M D , A T CAMERON, D SC , AND A. J DOUGLAS, M.D

TOTAL NUMBER OF CASES. These have been determined between the dates of July 1st and November 15th. There is no record of earlier cases though some are known to have occurred It is probable that the later records are also incomplete and an occasional case has been reported subsequent to November 15th

The numbers are compiled from the records of the City of Winnipeg Health Department, the Provincial Department of Health, and the Medical Research Committee, and are related as accurately as possible to the date of onset of the disease in every case The data are divided into three groups (1) City of Winnipeg (2) Suburbs in close contact with Winnipeg (St Charles, St James, Brooklands, West and East Kildonan, Transcona, St Boniface Norwood, Fort Garry) and (3) The rest of the Province

In Table I the incidence of the disease is shown by months

TABLE I

Month	Winnipeg	Suburbs	Rest of Province	Total
July	14	4	3	21
August	87	24	32	143
September	112	34	85	231
October	22	4	9	35
November (To 15th)	0	1	4	5
Totals	235	67	133	435

Since the date of onset in the provincial returns is only approximate (and this includes a large proportion of the cases from the suburbs) and where cases have come under observation of members of the Committee the known discrepancy has varied from two or three to seven days, closer analysis of the distribution according to time seems only useful for the cases in the City of Winnipeg A large proportion of the cases reported in the city has been checked by the Committee and the agreement as to date of onset is usually fairly good.

Fig 2 Incidence of cases of Poliomyelitis in the City of Winnipeg by days

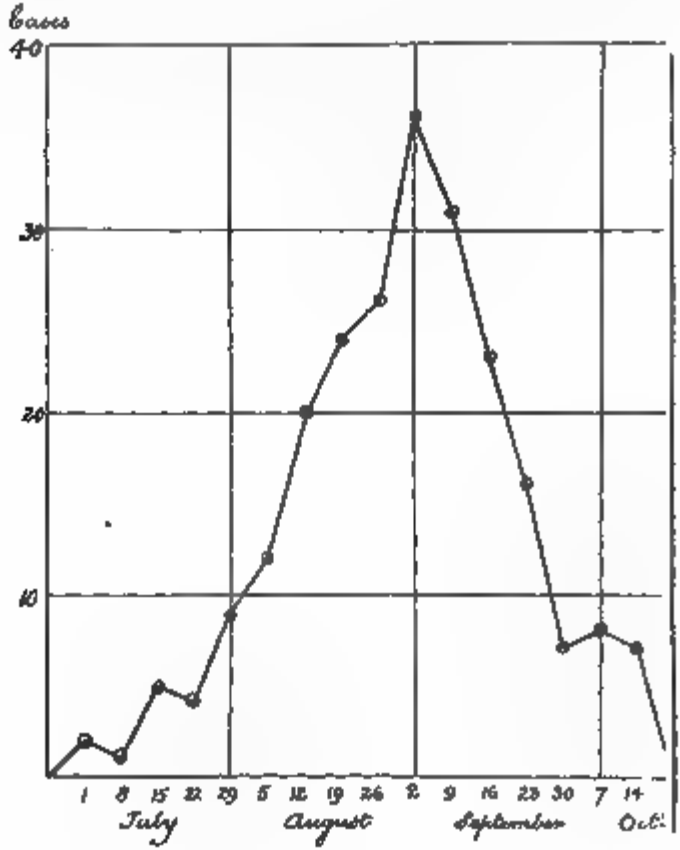


Fig 3 Incidence of cases of Poliomyelitis in the City of Winnipeg by weeks

In Figures 2 and 3 the incidence for the City of Winnipeg is shown by days and by weeks respectively Table I and these figures show that the height of the epidemic occurred in September in both city and country, the peak for the former occurring during the first week of September The daily records suggest increased incidence at intervals between 5 and 7 days.

INCIDENCE OF AGE. This has been compiled from those records in which age is stated, and is shown in Table II

TABLE II

INCIDENCE OF AGE

	Winnipeg		Suburbs		Rest of Province		Total	
	No.	%	No.	%	No	%	No.	%
Less than 5 ..	76	32.6	22	34	32	24 8	130	30.5
5 to less than 10	82	35 2	31	48	38	29.5	151	35 4
10 to less than 15	40	17 2	8	13	29	22.5	77	18 1
15 to less than 20	22	9 5	3	5	18	14.0	43	10 1
20 to less than 25	8	3 4	0	0	4	3 1	12	2 8
25 and over	5	2 1	0	0	8	6.1	13	3.1
Totals	233	100.0	64	100	129	100.0	426	100 0

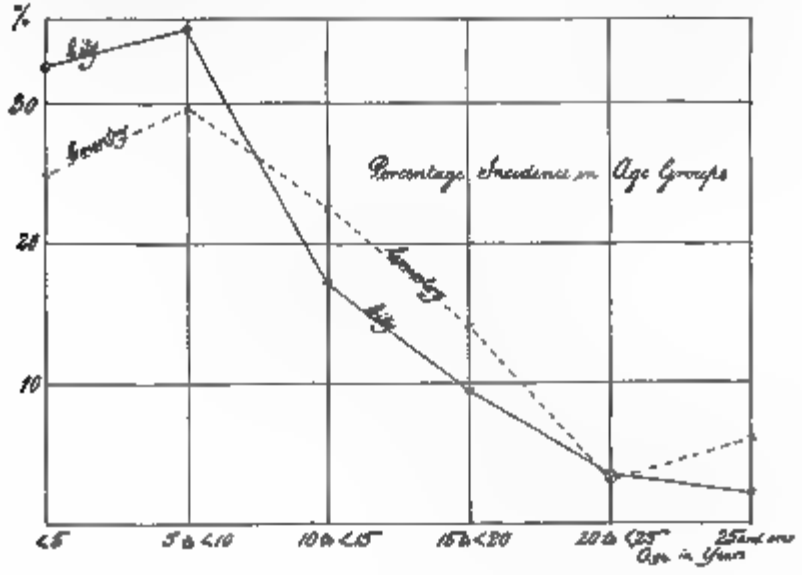


Fig 4. Incidents of Poliomyelitis in age groups in urban and rural districts

The results for the City of Winnipeg and for the country are shown graphically in Figure 4, which indicates clearly the greater incidence in the country than in the city for ages of 15 and over

INCIDENCE OF SEX In a few reports the sex was not stated The distribution between the sexes is shown in Table III

TABLE III

INCIDENCE OF SEX

	Males No.	Females No.	Males %	Females %
Winnipeg	132	102	56 4	43.6
Suburbs	29	26	53	47
Rest of Province	72	57	55 8	44.2
Total	233	185	55.7	44.3

These figures show uniformly a slightly greater incidence amongst males averaging 126 males to 100 females.

DISTRIBUTION IN THE PROVINCE It seems only possible to make an approximate classification by districts. The results of such a partial analysis are shown in Table IV

TABLE IV

DISTRIBUTION IN THE PROVINCE

EAST OF LAKE MANITOBA —				Woodroyd	2	
1 City of Winnipeg		237		Rockwood Mun.	2	
				Woodlands	3	
2 Winnipeg Suburbs		67		Stonewall	2	
3 Moosehorn	8			Inwood	2	
Ashern	5			Rosser Mun.	1	
Camper	1					13
Eriksdale	6		6	Winnipeg Beach	1	
	—	20		Camp Morton	1	
4 Arborg	4			Petersfield	1	
Riverton	7			Clandeboye	1	
Bifrost	2			Selkirk	2	
Arnes	1			E. Selkirk	2	
Gimli	2			Brokenhead Mun.	1	
	—	16		Beausejour	1	
5 St. Laurent	1				—	10

7	Springfield Mun	4	
	Great Falls	1	
	Whitemouth	1	
	Reynolds	4	
		—	10
8	Portage la Prairie and District		14
9	Dufferin Mun.	1	
	Roland Mun.	4	
	Stanley Mun	3	
		—	8
10	Headingly	1	
	Oak Bluff	1	
	La Salle	1	
	Osborne	1	
	Morris	1	
		—	5
11	Giroux	1	
	Sandilands	2	
	Labroquerie	1	
		—	4

West of Lake Manitoba	
Brandon	5
Neepawa	1
Langford Mun	1
Decker	1
Amaranth	1
Sidney	2
Wawanesa	1
Turtle Mts.	1
Souris and District	5
Cameron Mun.	1
Sifton Mun	2
Oak Lake	1
Woodworth Mun	1
Birtle Mun	1
Russell	1
Shellmouth Mun	2
Shell River Mun.	1
Roblin	2
Dauphin	1
Rejkjavik	1
The Pas	1

Table IV may be summarised as follows

City of Winnipeg	237
Suburbs of Winnipeg	67
REST OF PROVINCE—	
East of Lake Manitoba	100
West of Lake Manitoba	33

DEATHS. These are shown in Table V, in which the figures are classified according to date of onset of disease, not to date of death

TABLE V

	DEATHS			
Month	Winnipeg	Suburbs	Rest of Province	Total
July	2	0	0	2
August	10	2	5	17
September	3	1	11	15
October	2	0	1	3
November	0	0	0	0
Totals	17	3	17	37

DATA BEARING ON THE TRANSMISSION OF THE DISEASE

Four points will be considered

A Where two or more cases occurred in one family

B Where there was known contact of some kind or other between individuals of different families or between families.

C Where a series of closely adjoining cases occurred, without any known contact (Institutions are included here)

D The evenness or lack of evenness of the distribution

In considering (A), (B) and (C) only city and suburban cases will be dealt with on account of lack of detailed data for the others.

A OCCURRENCE OF TWO OR MORE CASES IN ONE FAMILY—

1 *The family Gr* Winona, aged 5 possible case (excluded from totals) ill Sept 17 or 18. Donald aged 8 definite case, onset Sept 18 Elaine, aged 2 definite case onset, Sept 18 Florence aged 4 definite case, onset Sept 24 Ian aged 6 definite case, onset Sept 30.

Here there is an outside source leading to two or possibly three cases, two on the same day and one (doubtful) either on the same day or the day preceding A fourth case occurred 6 days later, and a fifth 6 days after the fourth. It seems unavoidable to link these cases in three groups with a 6-day interval and transmission of the disease in some way or other from group to group Any other explanation is less likely since it must be more complex

2 *The family Mo* Margaret, aged 6 definite case onset about Aug. 1 Kathleen aged 2 definite case, onset about Aug 3 Lillian aged 3 doubtful case, onset about Aug 7

Here the dates were approximate and no definite conclusions as to intervals can be drawn

3 *The family Br*—Eunice, aged 12 possible case ill Oct. 1 Alan, aged 10 definite case onset Oct 5 Winifred, aged 3 definite case, onset Oct 11

No conclusion can be drawn involving the first case The interval between the second and third cases was 6 days.

TWO DEFINITE CASES IN THE SAME FAMILY—

4 *Family Ad.*—Hayden, aged 5 onset Sept 28. Dickson, aged 3 onset Oct. 5 interval 7 days.

Family Br —Herbert aged 8 onset Sept 4. Augusta, aged 11 onset Sept 7, interval 3 days.

Family Da Bernice aged 4 onset Aug. 20 Arnold, aged 8 onset Aug 25 interval 5 days

Family Hu. —William aged 6 onset Aug. 24 Bryan, aged 3 onset Aug 30, interval 6 days

Family Lo Dennis, aged 4 onset Sept 14 Thomas, aged 6 onset Sept 14, interval 0 days.

Family Os —Mabel, aged 1. onset Oct 6. Rita, aged 45 onset Oct 14, interval 8 days

Family Sh George, aged 6 onset July 27 William, aged 1 onset July 27, interval 0 days

Family Mo George, aged 3 onset Aug 25 Margaret, aged 4 onset Sept 1 interval 7 days.

Family Pr —George, aged 7 onset Aug. 1 Roger, aged 5 onset Aug 6, interval 5 days

Family Ko Irene, aged 7 onset Sept 11 Olga, aged 9 onset Sept 13, interval 2 days

The above fall into two groups, those with intervals of from 0 to 2 days on the one hand, and those with intervals of from 5 to 8 days on the other, with one exception the family Br It may be noted that the hospital records date the onset for Herbert Br at Sept 6th, a one day interval Excluding this family, the averages for the two groups are respectively 0 7 and 6 3 days.

5 *Two reported cases, or a second, doubtful, in the same family*

Family St.—Reginald, aged 9 reported to City, onset stated Aug 8 Harold, aged 14 reported to City, onset stated Aug 9, interval 1 day

Family Th Gordon, aged 5 reported to City, onset stated Aug. 28. Ethel, aged 12 definite case onset stated Sept 4, interval 7 days.

Family McD Bernice, aged 5 suspect, ill Oct 30 Child, aged 3 suspect, ill Nov 3, interval 4 days

Family Ov. Edmund, aged 7 reported to City, onset stated Oct 10 Herman, aged 8 reported to City, onset stated Oct 10, interval 0 days.

Family Fi Gordon, aged 3 reported to City, onset stated Aug. 14 Shirley aged 5 reported to City, onset stated Aug. 15, interval 1 day

Family Le —Betty, aged 2 reported to City onset stated Aug 21 (Sister was a probable case two weeks before)

Family, Wa —Kenneth. aged 2 reported to City, onset stated Aug 12 (Sister sick with similar symptoms 11 days before.)

Family Fa Mary aged 5 definite case, onset Sept 4 (Sister sick 8 days before Father sick 2 days before.)

Family Ha Teddy aged 4 definite case, onset Aug 19 (Sister aged 6, ill vomiting same day)

Family Od James, aged 1 reported to City, onset stated Aug 2. (Sister, aged 6, ill with a 'cold' 5 days before)

Family Wal Dorothy, aged 15 definite case, onset July 25 (Sister sick 7 days before)

Family McW William, aged 5 definite case, onset Oct 3 (Mother had pain in back and in bed for several days, the onset being 6 days earlier)

The mothers of two other cases had "colds 5 and 7 days before

While little can be based upon such indefinite reports yet the intervals seem to fall into the same two time-groups as the cases of (4)

B. ESTABLISHED CONTACT BETWEEN INDIVIDUALS OF DIFFERENT FAMILIES OR BETWEEN FAMILIES—

1 *Ernest Ge*, aged 2 reported to City, onset stated Aug 30 *Leonard Wat*, aged 15 definite, onset Aug 31, interval 1 day (L W was the uncle of E G)

2 *Norman Te*, aged 5 reported to City, onset stated Aug 30 *Mary Le*, aged 3 reported to City, onset stated Sept 4 interval 6 days.

3 *James Od*, aged 1 reported to City, onset stated Aug 2. *William Be* aged 6 definite onset Sept 2 *Jean An*., aged 6 reported to City, onset stated Oct 13

4 *Harvey Fi*, aged 5 definite, onset Sept 16. *Helen We*, aged 2 definite, onset Sept 23 interval 7 days.

5 *Kenneth St*, aged 3 definite, onset Sept. 4. *Sidney Ch*., aged 4 reported to City, onset stated Sept 9, interval 5 days

6 *Peter Ki*, aged 7 reported to City, onset stated Aug 12 *Murray McC*. aged 6 definite, onset Aug. 17, interval 5 days *Bruce McC*, aged 2 definite onset Sept 4, interval 18 days (Bruce and Murray McC. were cousins)

7 The families Mo. and Sh and the child McM The mothers of the two families were sisters, while the child McM lived below the family Mo.

Geo and Wm Sh, aged 6 and 1 both definite onset stated July 27 *Margaret Mo*. aged 6 definite, onset about Aug 1 *Kathleen Mo*, aged 2, definite onset about Aug. 3 *Lillian Mo*, aged 3 doubtful, presumed onset about Aug 7 *Alec McM* aged 1 definite, onset about Aug 8

In this series there appear to be two successive intervals of either 5 or 7 days.

C SERIES OF CLOSELY ADJOINING CASES WITHOUT ANY ESTABLISHED CONTACT—

(a)—Institutions The Knowles Home.

Alec Lou, aged 11 definite, onset Aug 26 *James O'B*., definite onset Sept 6, interval 11 days *Alec Log*, aged 10 reported to Province onset before Sept 7

(b)—Closely adjoining houses

1 *Ernest Ge*, aged 2 reported to City, onset stated Aug. 30, at 581 He Ave. *Helen Wh*, aged 3 reported to City, onset stated Aug 29, at 586 He Ave. *John Sh*, aged 11 definite, Sept 7, at 570 He Ave

2 *Claire Ra*, aged 4 reported to City onset stated Aug 26, at 603 Ju St *Napoleon Pe*, aged 16 reported to City, onset stated Sept. 15, at 597 Ju St.

3 *Jean Ca*, aged 8 reported to City onset stated Aug. 22, at 646 Vi St *William St*, aged 8 reported to City, onset stated Sept. 14, at 648 Vi St

4 *Frank Pa*, aged 14 definite, onset Sept 9, at 396 Fu St. *Mayford Sm.*, aged 11 definite, onset Sept. 19, at 385 Fu St *Hayden Ad*, aged 5 definite onset Sept. 28 at 422 La St

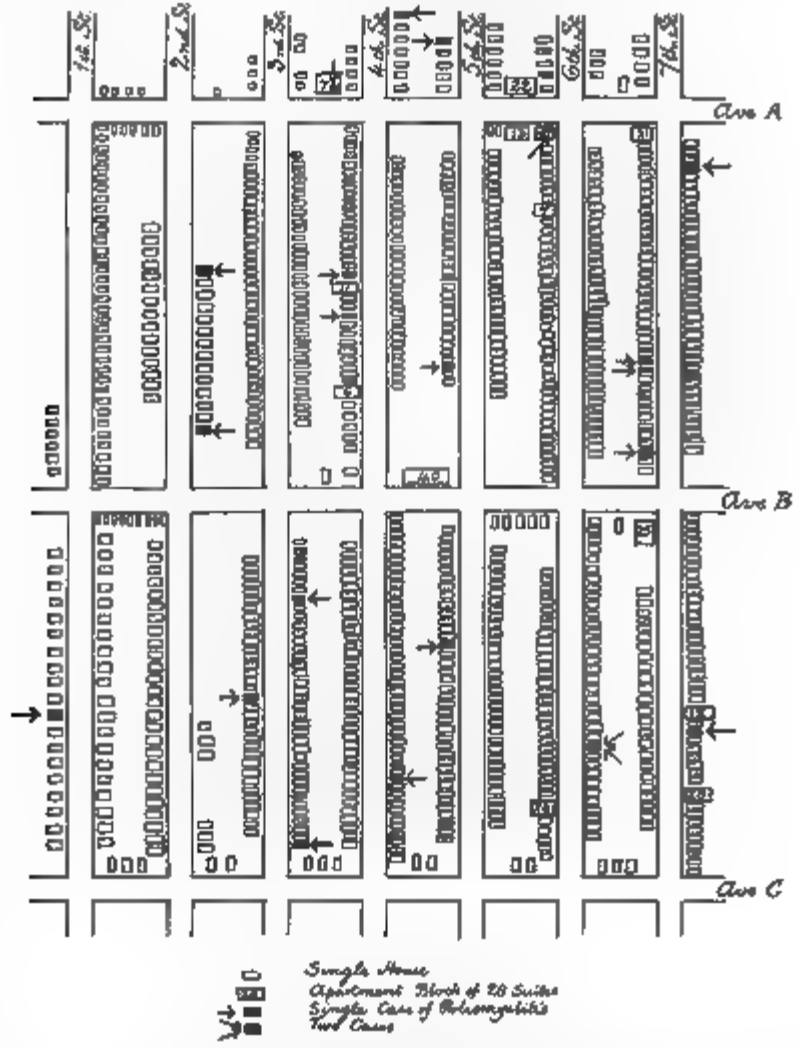
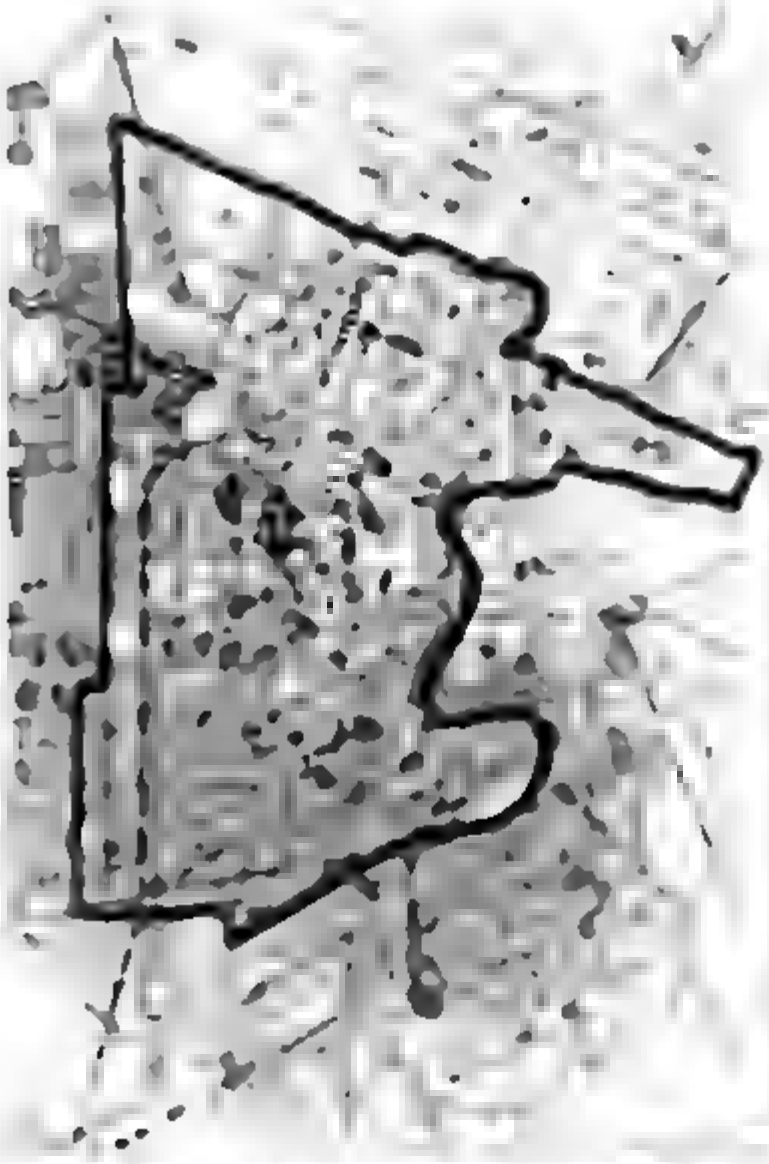


Fig. 5 Distribution of cases of Poliomyelitis in one of the most markedly affected areas in the City of Winnipeg

the two streets.)



Each case is represented by a black dot

5 *June Gu*, aged 3 definite, onset Aug. 26, at 479 El Ave *Dorothy Wa.* aged 6 definite onset Aug. 29, at 481 El Ave.

(c) The distribution through a district A typical, and one of the most markedly affected districts, is shown in Figure 5 It is to be remarked that in spite of the number of cases in the district, only a very small proportion of the houses in the district were actually affected

D THE EVENNESS OR LACK OF EVENNESS OF THE DISTRIBUTION

It would be extremely difficult to relate the incidence of cases in different parts of the City of Winnipeg and its suburbs to the density of population in these different parts. It may be noted that certain densely populated areas of the city were practically free Thus no cases occurred in the rectangle bounded by Sinclair St (West) Manitoba Avenue (North), Charles St (East), and Jarvis Avenue (South) with a single exception No cases occurred in the Point Douglas district east of Hamet Street No cases occurred in the district bounded by Osborne St, Arnold Avenue, and the Red River The general city distribution is shown in Figure 6

Certain information obtained for nine small districts in housing surveys in 1918, and 1921, has been related to the number of cases in those districts Table VI shows no relationship between overcrowding and incidence of the disease

TABLE VI

District	Population	(Date)	Average Family Including Boarders Per House or Suite	Persons per Room	Cases per 1,000 of Population
1 North	4795	(1921)	5.1	1.1	0.4
2 North (Adjoining 1)	3279	(1918)	4.8	—	2.4
3 West Centre	3332	(1921)	4.3	0.9	1.8
4 North East	3115	(1918)	4.2	—	0.3
5 West	2709	(1921)	4.1	0.7	0.7
6 Centre	5967	(1921)	4.0	1.0	0.6
7 West Centre (North of 3)	5384	(1921)	3.7	0.8	1.5
8 Centre	2394	(1918)	3.4	—	1.8
9 Centre	4141	(1918)	2.8	—	0.7

The relatively greatest density of cases was within the triangle bounded by Portage Avenue Notre Dame Avenue, and Dominion Street (See Figure 6)

Considering the province, the 14 cases in Portage la Prairie and district probably represent a greater relative incidence than in the City of Winnipeg itself Certain districts in the Eastern half of the Province showed an incidence much above that to be expected from a regular distribution as Table IV shows Insufficient data are available however to link up these cases Only 33 cases have been reported from the whole of the Western half of the Province

GENERAL CONCLUSIONS

The epidemic increased rapidly in both the City of Winnipeg and the rest of the Province until early in September, and decreased at approximately the same rate (cf Table I and Figure 3)

As far as accurate information permits a statement, the total number of cases between July 1st and November 15th was 435 of which 235 were in the City of Winnipeg, 67 in the adjacent suburbs, and 133 in the rest of the Province Of the latter the Portage la Prairie district and certain other districts in the Eastern half of the Province were particularly affected, there being no regular distribution The Western half of the Province was relatively little affected

Within the City of Winnipeg the centre showed the greatest incidence of cases while certain densely populated areas were practically free

Analysing the cases in age groups of 5 year periods the greatest number occurred in the group from 5 to below 10 years, while the number below 5 years of age was almost as great The country showed a relatively larger number of cases above 15 years of age, than did the urban population.

There was uniformly a greater number of males affected, the ratio being 126 males to 100 females

Of the 37 deaths 17 occurred outside the City and suburbs, there thus being a relatively greater proportion in the country areas

Evidence is adduced that where contact is known, through more than one case occurring in the same family or through other information, such cases were usually related by time intervals of less than 2 days or of 6 or 7 days The latter period occurred in a larger number of pairs of cases in the same family than did the short interval

It is reasonable to consider as a distinct possibility transmission of the disease from individual to individual *in some way* at present not definitely known.

If this be considered reasonably possible until some additional data become available it seems most logical not only to isolate all cases rigidly as early as possible, but also as a preventive measure to advise all having the care of children to keep them away from other children (and adults) as far as possible during an epidemic.

No evidence was brought forward which would lead us to conclude that milk, or any other food, insects, animals, or insanitary environment had anything to do with transmission. Particulars regarding these factors were obtained in each city case.

The question of unrecorded abortive cases has not been considered. We have indirect evidence that a large and quite indeterminate number of doubtful and probably abortive cases occurred and the actual numbers stated, though they include several doubtful and unverifiable cases, must be considered as distinctly less than the actual number of cases that occurred.

III

THE PREPARATION OF CONVALESCENT SERUM FOR THE POLIOMYELITIS EPIDEMIC IN WINNIPEG, 1928

By

FRED CADHAM, M.D., PROVINCIAL BACTERIOLOGIST

THE PREPARATION OF CONVALESCENT SERUM FOR THE POLIOMYELITIS EPIDEMIC IN WINNIPEG, 1928

By

FRED CADHAM, M.D.

Persons who had previously suffered from poliomyelitis and who had not been treated with convalescent serum reported to the laboratory They were requested to come just previous to the meal hour Blood was withdrawn from a suitable vein of the arm, into large sterile vacuum tubes. The blood was allowed to clot at room temperature and then placed in the ice chest for fifteen hours. The tubes were centrifuged and the serum pipetted off and pooled The serum for intravenous and intra-thecal use was put up in vials without the addition of any antiseptic to the serum intended for intramuscular use 0 25 per cent of tricreso. was added Twenty-five cubic centimeters were placed in each vial Four thousand cubic centimeters of the nine thousand c c prepared were heated at 55 degrees Cent. for 10 minutes No appreciable difference was noted in the therapeutic effect between the heated and the unheated serum. Serum direct from each vial was inoculated into deep tubes of serum glucose broth and cultured in order to test for sterility Subsequently the serum was examined daily, this of course was possible, the supply being controlled at one central depôt.

No person who had suffered an attack of poliomyelitis and who had received convalescent serum was used as a donor because of the possibility of their blood lacking the essential antibodies.

Wassermann tests were carried out on the blood of each donor

Four hundred cubic centimeters comprised the average amount of serum put up in any one day thus, a patient undergoing treatment as a rule received serum which had been prepared not more than six days previously

Only fifty to one hundred cubic centimeters of blood were withdrawn from a donor at one time It may be pointed out here, that frequently poliomyelitis donors are not of a robust type, and would not—or what also is important, they or their relatives believed they could not—withstand the withdrawal of any large amount of blood at one time Our experience was that because of the method of withdrawal of comparatively small amounts of blood at any one time, the same donors were willing to report frequently, and so a constant supply of serum was available. This I consider to be an advantage if the epidemic lasts over a considerable period of time.

IV

THE RESULTS OF CONVALESCENT SERUM THERAPY IN ACUTE POLIOMYELITIS IN THE MANITOBA EPIDEMIC, 1928

By

J. M. McEachern, M.D., Bruce Chown, M.D., Lennox G. Bell, M.D., and Mary McKenzie, M.D., Gordon Bell Fellow

THE RESULTS OF CONVALESCENT SERUM THERAPY IN ACUTE POLIOMYELITIS IN THE MANITOBA EPIDEMIC, 1928

By

JOHN M McEACHERN, M D , BRUCE CHOWN, M D , LENNOX G BELL, M D , AND MARY McKENZIE, M.D , GORDON BELL FELLOW

During the recent epidemic of poliomyelitis in Manitoba the responsibility for the preparation and distribution of convalescent serum was delegated to the Medical Research Committee of the University of Manitoba The serum was prepared under the direction of Dr F T Cadham and a number of us were appointed to act as honorary consultants for the Committee, to assist in the distribution of the serum, and to render aid if necessary in the diagnosis of the disease

As a result of this action the Medical Research Committee was able to regulate the supply of serum, reserving it for definite cases, and to obtain accurate histories and follow-up examinations in a large number of cases.

Of the cases seen by us 161 have been selected for the present report The bases of selection were simply, first a positive diagnosis, and second the accuracy of the records obtained If the characteristic symptoms of the disease were confirmed by a spinal fluid count of over 10 the case was considered to be definitely poliomyelitis. If in the absence of a cell count paralysis followed an acute febrile illness we felt justified in using this case in our series Since only one patient who had a normal cell count developed paralysis and the diagnosis of peripheral neuritis has not yet been ruled out in this case, we did not feel justified in including suspects of this type

The serum used was the pooled sterile, Wassermann negative, blood serum of from 6 to 8 donors These donors had had the disease from a few months to 33 years previously, each donor's case having previously been confirmed from original sources and by examination Only ten donors were employed who suffered from the disease during the present epidemic

The intramuscular use of convalescent serum is not new Notable studies with this method have been published by Shaw and Thelander (1)

Following the suggestion of Professor F T Cadham the intramuscular method of administration was used almost exclusively in the Manitoba epidemic. Standard doses of 25 c.c were used in the pre-paralytic stage of the disease. Subsequent doses were given by the same method if the disease was found to be progressive. Only a small number of cases received the serum intravenously or intrathecally

Over 8000 c c of serum were administered during the course of the epidemic, 98 per cent of which was obtained from local donors In no instance was there an immediate or late unfavorable reaction following the administration of this serum. Nor was there a single instance of infection following its use, which speaks well for the method of preparation

The convalescent serum treatment of poliomyelitis rests upon the observation of Romer and Joseph (2) that immune bodies are present in the blood of recovered cases The experiments of Flexner and Lewis (3) show that the injection of such serum delays and may altogether prevent the onset of paralysis in monkeys previously inoculated with the virus. Netter (4) was the first to treat human cases with convalescent serum

Much valuable work has been done in this field by Peabody' Draper, and Dochez (5), Amoss (6), Aycock and Luther (7), Shaw and Thelander (1), and others, but the value of this treatment is still held in doubt by many observers The chief handicaps to fair judgment of this problem are an insufficient number of control cases, the tendency of the virus to become attenuated in the later months of the epidemic, and the fact that a large number of patients recover without treatment It is also well known that cases occurring in country districts are more severe than the urban ones. This prevents the use of the country cases as controls It is felt that all these factors have been disposed of in the present study

Of the 161 cases here reported 74 received serum in the pre-paralytic stage of the disease, 54 received no serum, and 33 cases received serum too late to be of much value, that is, after the onset of paralysis. Each of the 161 cases was seen by one of us. Fifty per cent were studied by Dr Lennox Bell in the King George Hos-

pital The remainder were seen several times by the consultants of the Committee

In the following analyses, by early paresis or paralysis is meant the occurrence of such a catastrophe in the early stage of the disease usually between the 3rd and 10th day If paralysis or paresis was definitely found between the 3rd and 4th week of the disease it was termed residual paralysis or paresis. (These end results it is hoped will be further checked after 5 or 6 months.) Since all the cases were checked at approximately the same stage the results are comparable

The series has been divided into four groups

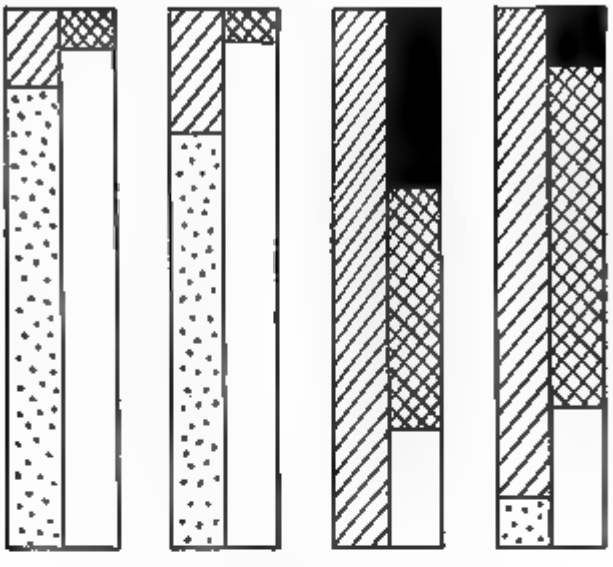
Group I consists of 57 cases which received an average of 25 c.c of serum intramuscularly in the pre-paralytic stage of the disease Of this group 93 per cent made a complete recovery There were no deaths.

Comparison of these results with those in Group IV who received no serum at all is interesting Of the 54 cases in Group 4 only 26 per cent made a complete recovery Eleven per cent died and the remainder were paralysed

Group III consists of those cases which received serum after the onset of paralysis. Of these 57 per cent became paralysed before the fourth day (Only 41 per cent of the cases which received no serum were paralysed by the fourth day.) Group III numbered 33 cases. Of these only 22 per cent made a complete recovery, 33 per cent died, and 45 per cent became paralysed. General observations upon these figures would seem to indicate firstly that the earlier the onset of paralysis the worse is the prognosis, and secondly, that serum is of little value once paralysis has ensued The fact that the cases in this group became paralysed at an earlier date may explain why serum was not administered in the pre-paralytic stage

Group II consists of 17 cases which received one or more doses of serum by various routes, or which received more than one dose of intramuscular serum. The results are approximately the same as those of Group I

These findings are summarized in Tables I and II, and the percentage figures of Table II are shown graphically in Figure 7



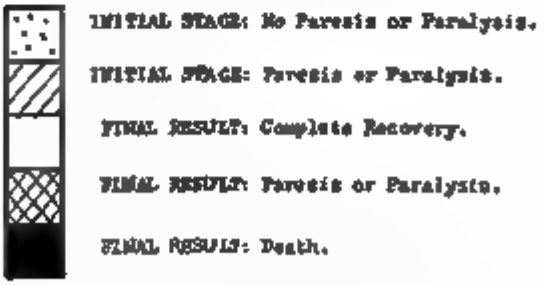


Fig. 7 Graphic representation of results of serum therapy, expressed in percentages Manitoba epidemic of Poliomyelitis 1928

TABLE I

Total number of cases	161
Total number of deaths	17
Per cent.	11%
Total residually paralysed	54
Per cent	33%
Total completely recovered	90
Per cent	56%

TABLE II

Group	Number of Cases	Number Completely Recovered	Percent Completely Recovered	Number Showing Residual Paralysis	Percent Residual Paralysis	Deaths No	Deaths %
I	57	53	93	4	7	0	0
II	17	16	94	1	6	0	0
III	33	7	22	15	45	11	33
IV	54	14	26	34	63	6	11

Group I —1 dose intramuscular serum in pre-paralytic stage

Group II 2 or more doses of serum by various routes (pre-paralytic stage)

Group III —Serum given after onset of paralysis

Group IV No serum given

Granted that the virus becomes attenuated in the later stages of an epidemic, in order to prove conclusively that serum is effective it becomes necessary to compare the figures during one given month of the epidemic That there is such a decrease in severity as shown in Table III

TABLE III

	Number of Cases	Early Paralysis %	Residual Paralysis %	Deaths %	Complete Recovery %
August—					
Cases without serum treatment	28	96	68	18	14
September—					
Cases without serum treatment	22	82	59	5	36

If, however, we compare the results of serum treatment with those of the controls, for the month of September, we find that the decrease in virulence indicated in Table III is much less evident than the improvement indicated by the figures for treated cases shown in Table IV. For example, of the 22 cases in September who received no treatment 36 per cent made a complete recovery, while of 50 cases in the same month who received serum in the pre-paralytic stage 94 per cent made a complete recovery.

TABLE IV

	Number of Cases	Early Paralysis %	Residual Paralysis %	Deaths %	Complete Recovery %
September—No serum.	22	82	59	5	36
September—Serum in pre-paralytic stage.	50	10	6	0	94

Tables III and IV are represented graphically in Figure 8.

It is generally recognised that the effect of the virus is greater in the country than in the city—that cases are more severe in the rural districts. If our control cases were entirely from the country and the treated cases from the city our results would be open to criticism. In Table V the September cases are further divided into those from the city, and those from the country.

TABLE V

CITY CASES IN SEPTEMBER

	Number of Cases	Early Paralysis %	Residual Paralysis %	Deaths %	Complete Recovery %
No serum.	14	86	50	7	43
Serum in pre-paralytic stage	43	7	5	0	95

COUNTRY CASES IN SEPTEMBER

	Number of Cases	Early Paralysis %	Residual Paralysis %	Deaths %	Complete Recovery %
No serum.	8	75	75	0	25
Serum in pre-paralytic stage	7	29	14	0	86

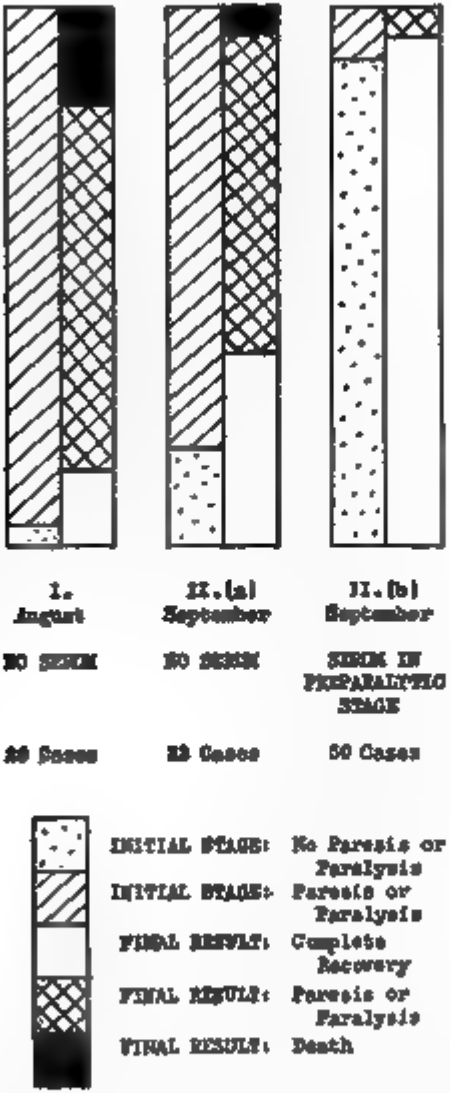


Fig. 8 Illustration of the lessened severity in the later stages of the Manitoba epidemic of Poliomyelitis, and of the beneficial effect of serum treatment during a definite time-period of the epidemic (percentage results)

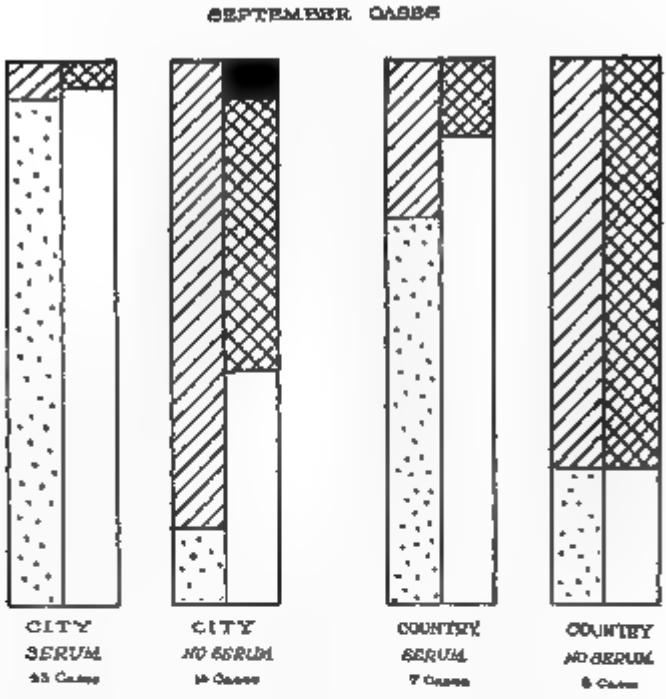


Fig 9. Percentage results of treated and untreated cases of Poliomyelitis analysed for the City and for the country separately (month of September).

These results are shown graphically in Figure 9 From them it will be seen that criticism based upon incorrect use of city and country cases has been disposed of

A final criticism may be raised Are not the beneficial results observed in the serum-treated cases due to the fact that they are milder cases, that the controls for the most part are those seen after paralysis had occurred?

This objection is not so easily disposed of, but we may answer it from several different angles

First, the marked actual differences in percentages of complete recovery between the treated cases and the controls in September should in themselves be sufficient to override this objection

Secondly, during that month nearly every case occurring in the city was seen by the Committee, and there is no reason to suppose

that the severe cases were almost entirely absent from the treated group of nearly 60 cases.

Thirdly, if we assume that serum has no therapeutic value whatever, an accurate analysis according to the statistical method by a qualified statistician has shown that the results shown in Table V could only occur once in five hundred times. The arbitrary level of significance is taken to be one in thirty

Fourthly, following Draper's view that a cell count of over 100 indicates a serious type of disease (8), a comparison of the cell counts in treated cases and controls in Table VI shows no appreciable difference in numerical incidence of the counts from which it would follow that there is no significant difference in the average severity of the two groups of cases. 92% of these counts in the treated cases were made by the fifth day of the disease 82% were made by the fifth day in the controls The difference of 10% is not felt to be significant as there is no marked change in the cell counts during the first week of the disease (Peabody [5])

TABLE VI

INCIDENCE OF CELL COUNTS IN TREATED AND CONTROL CASES

Cell Counts	Treated Cases	Control Cases
0- 99	36	23
100- 199	12	10
200- 299.	6	4
300- 399	0	0
400- 499.	2	1
500-1000	2	2
1000-2000	2	0
Total	60	40

Finally it is felt that a comparison of the results in cases which had early paresis or paralysis with the end results will give us the true index of recovery in treated and untreated cases. It is well known that the initial lesion is the ultimate reaction to the virus. For example no case which initially developed paresis without paralysis, subsequently — that is after a lapse of three or four weeks — developed paralysis The results of the comparison are seen in Table VII and VIII

TABLE VII

END RESULTS IN CASES WHICH HAD EARLY PARESIS OR PARALYSIS

	Number of Cases	Percent Recovered	Percent Residual Paralysis or Death
Treated Groups I and II	13	62	38
Control Groups III and IV	82	20	80

TABLE VIII

RESULTS IN CASES WHICH HAD EARLY PARESIS ALONE

	Number of Cases	Percent Recovered	Percent Residual Paralysis
Treated Groups I and II	12	67	33
Control Groups III and IV	30	40	60

These results seem to justify the use of serum in the pre-paralytic stage

IMMEDIATE RESULTS FOLLOWING THE USE OF THE SERUM

Within a few hours following the use of the serum the usual result was a drop in temperature and complete recovery from most of the symptoms complained of It should be noted, however, that a drop in temperature and apparent beneficial results following the use of the serum occurred in cases afterwards proved to be ordinary febrile disturbances and not poliomyelitis. This, of course, does not detract from the therapeutic value of convalescent serum in poliomyelitis, but indicates that some part of the beneficial effect may be due to other than specific factors in the serum

CONCLUSIONS

1 Convalescent serum is of value when administered in the pre-paralytic stage of the disease

2. The intramuscular route of administration is simple, safe, and sufficiently efficacious to justify its use during an epidemic

REFERENCES

1 Shaw and Thelander J Am. Med Assoc , 1928, xc 1923

2 Romer and Joseph, Milnch Med Wochenschr 19.0, lvn, 568.

3 Flexner and Lewis, J Am Med Assoc , 1910, iv, 662

4 Netter quoted by Draper, Nelson s 'Living Medicine Vol. II, p 67

5 Peabody, Draper and Dochez, Monographs Rockefeller Inst Med. Res , 1912.

6 Amoss. J Am Med. Assoc , 1917, lxvi.., 994

7 Aycock and Luther, J Am. Med Assoc , 1928, xci, 387

8 Draper, Acute Poliomyelitis, ' Philadelphia, 1917

V

SUMMARY OF THE SYMPTOMATOLOGY AND LABORATORY FINDINGS IN ACUTE POLIOMYELITIS IN THE MANITOBA EPIDEMIC, 1928

By

J. M. McEachern, M.D., Bruce Chown, M.D., Lennox G. Bell, M.D. and Mary McKenzie, M.D., Gordon Bell, Fellow

With an Appendix on

THE PATHOLOGY OF THE EPIDEMIC

By

Wm. Boyd, M.D.

SUMMARY OF SYMPTOMATOLOGY AND LABORATORY FINDINGS IN ACUTE POLIOMYELITIS IN THE MANITOBA EPIDEMIC, 1928

By

J M MCEACHERN, M.D., BRUCE CHOWN, M.D., LENNOX G BELL, M.D., AND MARY MCKENZIE, M.D., GORDON BELL FELLOW

WITH AN APPENDIX ON

THE PATHOLOGY OF THE EPIDEMIC

By

WM. BOYD, M.D

In a previous paper by McKenzie, Cameron and Douglas, an analysis of the total figures for the Winnipeg epidemic of poliomyelitis has been submitted. It is felt that the records of the 161 cases studied in detail by the Committee will be interesting

SEX. Of these cases 99, or 62 per cent were males, 62 or 38 per cent were females

AGE GROUPS In Table I is offered a comparison of the age groups in the Winnipeg epidemic, the New York epidemic of 1907 and the Rockefeller Institute studies of 1911 It will be seen that there is a high incidence over the age of 15 in the Winnipeg epidemic, 20 per cent being 15 years or over

TABLE I

	AGE (Years)								
	Under 1	1-4	5-9	10-14	15-19	20-24	25-29	Over 30	Total
Medical Research Committee.. ..	3	35	59	32	20	4	5	3	161
Rockefeller Institute 1911	18	109	12	4	0	1	0	0	157
New York Epidemic, 1907	62	507	131	21	5	1	2	0	729

MORTALITY There were no deaths under 5 years in the 161 cases studied. The greatest number of deaths (7) occurred between 5 and 9 years of age. There were 11 deaths in males and 6 in females. The death rate was 10 per cent (17 in 161 cases) in both sexes

SPINAL FLUID Spinal Fluid observations are recorded in 116 cases out of 161 Cell counts were made in all these 116 cases. Ninety-two or 79 per cent of the fluids showed a cell count between 10 and 200 cells The counts ranged from 10 to 1809 cells.

TABLE II

Distribution	Cases	Distribution	Cases
10- 49	44	450- 499	1
50- 99	24	500- 549	0
100- 149	11 (92 or 79%	550- 599	3
150- 199	14	600- 699	2
200- 249	8	700- 799	0
250- 299	4	800- 899	0
300- 349	0	900- 999	0
350- 399	0	1000-1499	3
400- 449	2	1500-2000	1
			116

As found by previous observers the prognosis was as a general rule more serious with the higher cell counts. There are many individual exceptions to this rule

TABLE III

RELATION OF PROGNOSIS TO SPINAL FLUID COUNT

	No of Cases	Percent Recovery	Percent Paralysed	Percent Deaths
10- 99	68	72	22	6
100–199	24	58	29	13
200–299	12	58	42	0
Over 300	12	50	33	17
Total	116			

This rule holds for both treated and untreated cases although the cases are not well distributed for comparison.

TABLE IV

PROGNOSIS AND SPINAL FLUID COUNT IN SERUM TREATED CASES

Cell Counts	Number of Cases	Recovery		Paralysis		Deaths
		No. of Cases	Percent	No of Cases	Percent	
10- 99..	40	38	95	2	5	0
100-199..	12	11	91	1	9	0
200-299	8	7	87	1	12	0
Over 300	7	5	71	2	29	0

TABLE V

RELATION OF PROGNOSIS TO SPINAL FLUID COUNT –NO SERUM

Cell Counts	No. of Cases	Recovery		Paralysis		Deaths	
		No	%	No.	%	No.	%
10- 99.	28	1	39	13	47	4	14
100-.99	12	3	25	6	50	3	25
200-299	4	0	0	4	100	0	0
Over 300	5	1	20	2	40	2	40

URINALYSIS Urinalysis was done in 77 cases, of these 54 were negative 23 showed a marked albuminuria 14 revealed gross and microscopic blood 3 had gross pus in the specimen.

LEUCOCYTE COUNTS Leucocyte counts were done in 43 cases 12 were under 10,000 23 between 10 000 and 14 000 per cu. mm and 8 gave counts of over 15,000 In other words 31 cases out of 43 showed a leucocytosis. Lymphocytosis was the rule

THE COLLOIDAL GOLD REACTION The Colloidal Gold Test was done on 46 spinal fluids, 41 gave a positive reaction usually in the mid zone A composite colloidal gold reaction for the group would read as follows, 01232.0000 No correlation between the day of disease, the cell count or the extent of the paralysis was found 16 positive reactions were found in febrile diseases other than poliomyelitis.

ONSET OF PARALYSIS. Of the 90 cases in the group who became paralysed, 51 were paralysed by the third day The peak of the onset of paralysis was also reached on the third day as seen in Table VI

TABLE VI

ONSET OF PARALYSIS

Day	Number of Cases
1	8
2	14
3	29
4	19
5	7
6	1
Over 7	12
	90

While the symptoms of acute poliomyelitis have been analyzed in the following pages the classic description of the disease in the pre-paralytic stage is that of Aycock and Luther We take the liberty of publishing their clinical summary in detail as it was widely referred to during the course of the Winnipeg epidemic and found to be invaluable.

DIAGNOSIS OF POLIOMYELITIS IN THE PRE-PARALYTIC STAGE

(AYCOCK AND LUTHER)

"The child seems prostrated to a greater degree than the temperature, which is usually under 102° F., would indicate. The face is flushed, the expression is anxious, and there is frequently pallor about the nose and mouth. The throat is mildly injected, but not enough in itself to account for the child's condition. The pulse is usually rapid out of proportion to the temperature. The rest of the physical examination is negative except for that portion which deals with the nervous system. There is frequently a rather coarse tremor when the child moves, which may be striking. There is a distinct rigidity of the neck, however, this is not as marked as that usually seen in meningitis. The patient tilts the head on the neck but does not bend the neck on the shoulders. As a result, the head can be brought about half way forward, when resistance is encountered, and the child complains of pain. More constant and more characteristic than the stiffness of the neck is a stiffness of the spine. This is best brought out by having the patient sit up in bed and try to bend the head down onto the knees. The average child ill with other infections, is very flexible and has no difficulty in doing this. If these patients bend forward at all it is from the hips, with the spine held rigidly. Many of them cannot assume a comfortable sitting position without propping themselves up on their arms. Anterior flexion of the spine often causes a drawing pain in the lumbar region. Kernig's sign is not usually marked at this stage, but the deep reflexes are frequently hyperactive rather than diminished, as they are later. A cerebral tache is almost always present, not infrequently becoming a purplish irregular blotchy line a half inch or more in width. It is the presence of these signs and symptoms which justifies a probable diagnosis of anterior poliomyelitis and calls for the final step in the diagnosis.

"This step is examination of the spinal fluid. The fluid is usually under moderately increased pressure (from 50 to 200 mm. of water). Macroscopically the fluid appears to be clear, but when viewed by transmitted light it presents a faint haziness which has been described by Zingher as a 'ground glass' appearance. There is an

increase in cells, usually between 50 and 250, but occasionally as high as 700 to 800, or as low as 20 These cells may be largely polymorphonuclear early, but later are lymphocytes. There is an increase in globulin "

(Reference "Aycock and Luther," J Am. Med Assoc 1928, 91, 387)

ANALYSIS OF SYMPTOMS IN 152 CASES OF POLIOMYELITIS

Symptom	No. of Cases	Percent
Fever	133	87 5
Frontal Headache	122	80 3
Stiff Sore Neck and Back	111	73 0
Lumbar Pain	77	50 6
Anorexia	71	46 7
Malaise	68	44 7
Vomiting	63	41 4
Pain in Limbs	57	37 5
Irritability and Restlessness	56	36 8
Paresis	50	32.8
Drowsiness	39	25.6
Constipation	37	24 3
Nausea	26	17 1
Paralysis	26	17 1
Abdominal Pain	21	13 7
Tremor	20	13 1
Coryza	15	9 8
Hyperaesthesia	13	8.5
Chills	12	7 8
Rash	12	7 8
Intrascapular Pain	11	7 2
Occipital Headache	11	7 2
Chest Pain	10	6.5
Sore Throat	9	5 9
Vertigo	9	5.9
General Weakness	9	5 9

Symptom	No. of Cases	Percent
Insomnia	8	5.2
Diarrhoea	7	4.2
Diaphoresis	5	3.2
Epistaxis	5	3.2
Delirium	3	1.9
Nocturia	2	1.2
Girdle Pains	2	1.2

CHART SHOWING INITIAL OCCURRENCE OF SYMPTOMS

FIRST DAY OF DISEASE

Symptom	No. of Cases	Percent
Fever	74	48.6
Frontal Headache	74	48.6
Malaise	55	36.1
Anorexia	40	26.3
Stiff Sore Neck and Spine	29	19.
Vomiting	27	17.7
Irritability and Restlessness	22	14.4
Lumbar Pain	22	14.4
Abdominal Pain	18	11.8
Drowsiness	17	11.1
Constipation	17	11.1
Pain in Limbs	17	11.1
Coryza	16	10.5
Nausea	9	5.9
Intrascapular Pain	8	5.2
Chills	8	5.2
Sore Throat	6	3.9
Insomnia	6	3.9
Tremor	5	3.2
Vertigo	5	3.2
Diarrhoea	4	2.6
Epistaxis	4	2.6

Symptom	No. of Cases	Percent
Chest Pain	3	2.0
Hyperaesthesia	3	2.0
Occipital Headache	3	2.0
Paresis	3	2.0
Girdle Pain	2	1.3
Delirium	1	0.6

SECOND DAY OF DISEASE

Symptom	No. of Cases	Percent
Stiff Neck and Back	36	23.6
Fever	29	19.0
Frontal Headache	22	14.4
Pain in Limbs	21	13.8
Lumbar Pain	19	12.5
Irritability	17	11.1
Anorexia	15	9.8
Vomiting	14	9.2
Constipation	9	5.8
Paresis	9	5.8
Tremor	8	5.2
Malaise	6	3.9
Nausea	6	3.9
Drowsiness	6	3.9
Weakness	5	3.2
Hyperaesthesia	5	3.2
Occipital Headache	4	2.6
Chest Pain	3	1.6
Paralysis	3	1.6
Chills	2	1.3
Diarrhoea	2	1.3
Intrascapular Pain	2	1.3
Sore Throat	2	1.3
Insomnia	2	1.3
Diaphoresis	2	1.3
Rash	1	0.6
Epistaxis	1	0.6
Delirium	1	0.6

THIRD DAY OF DISEASE

Symptom	No. of Cases	Percent
Stiff Neck	22	14.4
Lumbar Pain	19	12.5
Fever	16	10.5
Paresis	16	10.5
Frontal Headache	14	9.2
Vomiting	13	8.5
Paralysis	12	7.9
Rash	0	6.5
Irritability	10	6.5
Pains in Limbs	8	5.2
Nausea	8	5.2
Drowsiness	7	4.6
Anorexia	7	4.6
Malaise	6	3.2
Constipation	6	3.2
Tremor	6	3.2
Hyperaesthesia	4	2.6
Vertigo	3	1.6
Occipital Headache	3	1.6
Diaphoresis	2	1.3
Chills	2	1.3
Nocturia	2	1.3
Frequency	1	0.6
Diarrhoea	1	0.6
Abdominal Pain	1	0.6
Intrascapular Pain	1	0.6

FOURTH DAY OF DISEASE

Symptom	No. of Cases	Percent
Stiff Neck	13	8.5
Paresis	13	8.5
Paralysis	11	7.2
Fever	11	7.2
Lumbar Pain	11	7.2
Frontal Headache	9	5.9
Pains in Limbs	6	3.9

Symptom	No. of Cases	Percent
Irritability	5	3.2
Anorexia	5	3.2
Drowsiness	5	3.2
Vomiting	4	2.6
Constipation	4	2.6
Nausea	2	1.3
Abdominal Pain	2	1.3
Delirium	1	0.6
Chest Pain	1	0.6
Rash	1	0.6
Diaphoresis	1	0.6
Sore Throat	1	0.6
Occipital Headache	1	0.6

PHYSICAL FINDINGS

TOTAL NUMBER OF CASES 164

	Number	Percent
Abdominal Reflexes		
Exaggerated one side	2	1.2
Exaggerated both sides	8	4.8
Absent one side	7	4.2
Absent both sides	57	34.7
Diminished	1	0.6
Adenitis	34	20.7
Ankle Jerks		
Exaggerated one side	0	0.0
Exaggerated both sides	7	4.2
Absent one side	2	1.2
Absent both sides	12	7.3
Diminished	0	0.0
Bladder Disturbances	12	7.3
Biceps Jerks		
Exaggerated one side	0	0.0
Exaggerated both sides	6	3.6
Absent one side	9	5.4
Absent both sides	3	1.8
Diminished	1	0.6

	Number	Percent
Babinski Positive	3	1 8
Brudzinski s Sign Present	7	4 2
Cremasteric Reflex		
Exaggerated one side	0	0 0
Exaggerated both sides	2	1 2
Absent one side	0	0 0
Absent both sides	13	7 9
Diminished	0	0.0
Conjunctivae Injected.	13	7 9
Ankle Clonus Present	4	2 4
Dazed Appearance.	25	15 2
Herpes	0	0 0
Hyperaesthesia	5	3 0
Kernig s Sign Present	60	36 5
Knee Jerks		
Exaggerated one side	6	3 6
Exaggerated both sides.	29	17.6
Absent one side	16	9.7
Absent both sides	54	32 9
Diminished	14	8 5
Muscle Tenderness	25	15 2
Nystagmus.	4	2 4
Paresis or Paralysis.	81	49 3
Retraction of Head.	24	14.6
Rigid Neck	85	51 8
Rash	9	5 4
Spine Sign.	120	73 1
Septic Teeth	11	6 7
Strabismus.	1	0.6
Tache	12	7 3
Throat Injected.	65	39.6

The important signs and physical findings in the early stage of the disease were absent abdominal reflexes spine sign, rigid neck, positive Kernig s sign, absent knee jerks

A NOTE ON THE PATHOLOGY OF THE EPIDEMIC

By

WILLIAM BOYD, M D

Autopsies were performed on five cases of poliomyelitis In two of these the examination was confined to the central nervous system. In three a complete post mortem examination was made

The lesions found in the nervous system were those recognised as being characteristic of the disease. They were in no way unusual There was evidence of a severe inflammation most marked in the grey matter but also present in the white matter, involving the whole of the cord and the brain stem Marked lesions were found in the medulla, pons, and mid brain, but above that level there was a sudden disappearance of the lesions. None were found in the basal ganglia or cerebral cortex.

In the cases in which a general examination was made no definite evidence was found in support of the idea that the disease is a septicaemia The inflammatory lesions were entirely confined to the central nervous system.

APPENDIX I

METHODS OF CONTROL IN THE CITY OF WINNIPEG

By

A J Douglas, M D., Health Officer, City of Winnipeg

METHODS OF CONTROL IN THE CITY OF WINNIPEG

By

A. J. DOUGLAS, M.D.

Cases where home surroundings were not satisfactory were hospitalized.

Where the patient was isolated in the home the following measures for disease control were recommended.

Children who resided on the premises were isolated and kept under observation. Food handlers were similarly dealt with unless arrangements were made for their change of address, the individual was prohibited from engaging in such occupation for a period of two weeks from last exposure to a known case.

This procedure was also carried out with persons having to do with children.

ISOLATION

The sick-room was prepared as in other acute infections, screening being emphasised. Where nose and throat discharges could be received on rags or other suitable material and burned, this course was recommended, alternative, immersion in a strong solution of disinfectant before being disposed of. Disinfectant was supplied by the Department. Concurrent disinfection was stressed. Sick-room dishes, etc. were kept separate, sterilization was recommended when it was necessary to remove them from the sick-room. Clothing and bed-linen were sterilized by heat or put through a suitable disinfectant.

At the termination of the case thorough cleansing, sunning and airing of all material in the sick-room, and scrubbing of sick-room with soap and warm water was advised.

The opening of the city schools, public and parochial, private schools, and Sunday schools was delayed one month. This procedure was decided upon at a meeting of the Provincial Board of Health with the school authorities. It was recognized that this measure was of doubtful efficacy as regards prevention of spread. It was valuable however in the sense that it went a long way to allay public alarm or anything in the nature of panic, indeed, it was demanded by a large number of our people. In this connection the daily news-

papers of the city performed a great service to relieve uneasiness through the intelligent and common sense way they handled news regarding the outbreak. Nothing was held back, the seriousness of the situation was not minimized, but no scare stories or exaggerated statements were printed. Six short articles on Poliomyelitis were prepared by members of the Winnipeg Medical Society as follows: Pathology, Symptoms, Serum Treatment, After-treatment, Epidemiology, and Control. One of these was published each day by the daily papers until the series was finished. This series forms Appendix III of these reports.

The form used by the Winnipeg Health Department is appended. This gives an idea of the information which was sought regarding each case.

ACUTE ANTERIOR POLIOMYELITIS

Report Number ..... Date ..... Name .....
Age ..... Telephone ..... Address .....
Occupations of Inmates .....
Occupation of Patient ..... Where Employed .....
Visiting Addresses in City .....
Visiting Addresses out of City .....
School attended by Patient .....
Schools attended by other Members of Family .....
Number of Occupants: Adults ..... Children .....
Physician attending ..... Reported By .....
Home ..... Hospital .....
Date of Symptoms ..... Date of Paralysis .....
Present Condition ..... Headache .....
Temperature ..... Vomiting ..... Sore Throat .....
Convulsions ..... Drowsiness ..... Restlessness .....
Milk Supply ..... Cream or Ice Cream .....
Milk Supply away from Home .....
Cream or Ice Cream away from Home .....
Fruit, Milk or Vegetables from Store .....
Fruit, Milk or Vegetables from Hawkers .....
Food Supplies from any other source .....
Water Supply ..... Ice ..... Butter .....
Is Ice used for Drinking Water .....
Sanitary Conditions of Premises ..... Detached House .....
Animals on Premises ..... Sickness .....
Flies or Other Insects .....
Outside Case ..... City Case ..... Contact Case .....
Lumbar Puncture .....
Has Patient received Serum Treatment .....
Remarks .....

Inspector

APPENDIX II

METHODS OF CONTROL RECOMMENDED BY THE DEPARTMENT OF HEALTH AND PUBLIC WELFARE

By

T A Pincock m d Deputy Minister

METHODS OF CONTROL RECOMMENDED BY THE DEPARTMENT OF HEALTH AND PUBLIC WELFARE

By

T. A. PINCOCK, M.D.

The lack of accurate knowledge of the mode of transmission of Anterior Poliomyelitis tends to make efforts directed at control somewhat empirical in nature.

Discussion of the subject falls into several distinct headings:

(a) Co-operation of the Municipal Health Officers
(b) Co-operation of the Medical Profession
(c) Publicity through the Press as a means of educating the public
(d) Isolation and quarantine
(e) Concurrent disinfection
(f) General measures

(a) CO-OPERATION OF THE MUNICIPAL HEALTH OFFICERS. During July and the early part of August individual members of the City of Winnipeg and Provincial Health Departments began to experience considerable uneasiness because of the occurrence of sporadic cases of Anterior Poliomyelitis. It was recognised that the Province was faced with the possibility of a severe outbreak of the disease.

With the idea, therefore, of putting health officers on their guard, and at the same time avoiding undue alarm, the following letter was sent to Municipal Health Officers:

Municipal Health Officer

Dear Sir,

As this is the season in which Anterior Poliomyelitis is likely to be prevalent, the following general preventative measures are suggested:

POLIOMYELITIS

1. Isolation of patient.
2. Concurrent disinfection—meaning disinfection of individuals and articles which come in contact with the patient.

3 Patient to be removed to hospital, or to be taken care of by ONE person.

4 Observation of contacts.

5 Exclude contacts from schools, public institutions, and meetings for at least two weeks

6. Disinfection of outdoor closets in country towns and destruction of flies where possible

DEPARTMENT OF HEALTH
AND PUBLIC WELFARE

Shortly after this the number of cases notified to the Department being rapidly on the increase, a second letter was dispatched not only to health officers—but to all physicians in the Province

Dear Doctor

Poliomyelitis has appeared at a number of points in the Province The Board of Health would therefore request physicians to be on the lookout for cases.

Definite and suspicious cases should be isolated and disinfection of discharges thoroughly carried out Children and young adults exposed to infection should be kept under observation for fourteen days Persons caring for patients should avoid contact with food used by others

Professional food handlers particularly those having to do with meals, should not engage in their occupation for two weeks from last exposure

DEPARTMENT OF HEALTH
AND PUBLIC WELFARE

A special report form prepared by the City Health Department was used by the Health Inspectors of the city to investigate cases reported (see appendix No 1) This form, slightly modified was sent to physicians in rural communities, who reported cases, the idea being to record as fully as possible such facts as, age, residence, occupation, contacts, symptoms with date of onset, various food supplies with special reference to milk, fruit, butter, ice and water supply and sanitation of premises. The question of animal contact and contagion by means of vectors were also part of this report

(b) CO-OPERATION OF MEDICAL PROFESSION The beneficial effects of a close working co-operation between the medical fraternity and Officials of Health Departments were amply demonstrated On August 26th, a special meeting of the Winnipeg Medical Society was called by the Executive of the Society Papers were presented dealing with the Pathology, Symptomatology, Bacteriology Serum Therapy Epidemiology and treatment of the aftermath of the disease and fully discussed At this meeting there was appointed an editorial committee of the Medical Society especially acquainted with the phases of the subjects enumerated above

(c) PUBLICITY AS A MEANS OF EDUCATION OF THE PUBLIC. The function of this Educational Committee was to see that material submitted to the press was of such a nature as to meet with the approval of the profession, that it be informative without being unduly technical and at the same time quiet the fears of the public The result of this publicity was evidenced in early diagnosis, more thorough reporting and greater demand for serum The articles published form Appendix III

(d) ISOLATION AND QUARANTINE All cases reported were isolated by being sent to hospital or kept at home and being attended by one person All contacts were kept under observation for a period of fourteen days. Child-contacts were quarantined Adult-contacts were allowed to attend their occupations provided such occupation did not bring them into intimate contact with children or involve the handling of food for public consumption.

(e) CONCURRENT DISINFECTION Nose throat and bowel discharges and all articles soiled therewith were disinfected

(f) CLOSING OF SCHOOLS Rural and suburban health officers were informed of the action of the Civic Health Authorities in delaying the opening of schools. They were instructed to use their own discretion, depending upon the incidence of disease in their communities Suburban municipalities closed their schools, as did also a number of rural communities A large number of schools throughout the Province, however remained open especially where no cases had occurred, or where in spite of incidence of disease contacts had already been established

APPENDIX III

Brief articles on the nature and treatment of Poliomyelitis prepared by a committee of the Winnipeg Medical Society and published in the Winnipeg daily newspapers during the height of the epidemic (September 1st to 7th, 1928)

NATURE OF THE DISEASE

Infantile paralysis, or poliomyelitis, as the name implies, is an acute inflammation (itis) of the grey matter (polio) of the spinal cord or marrow. It is more than this, however. The inflammation may extend upwards so as to affect the vital centres in the lower part of the brain, thus leading to paralysis of respiration, which is the common cause of death. Sometimes, especially when the disease appears in epidemic form, the brunt of the attack may fall upon these vital centres, and there may be no sign of the paralysis of the arms or legs, which indicates injury to the spinal cord in the ordinary case. But the infection is even more widespread. For evidence of the action of the virus or germ which causes the disease is found in many other organs besides the brain and spinal cord. The modern conception of the disease is that the infection, probably gaining entrance through the nose and throat, is widely diffused throughout the body, that in only a very limited number of persons does the infection reach the brain and cord, and that persons showing no paralysis nor other evidence of disease of the nervous system may act as carriers.

The pathological changes in the nervous system are inflammatory in nature, and quite similar in kind to those of sleeping sickness (encephalitis) and other inflammations of the brain and cord. As a result of the inflammation, the nerve cells in the cord which supply the muscles of the arms and legs are destroyed, and there is more or less complete paralysis. It is seldom that all the cells in one area are destroyed, so that the paralysis is often merely partial, and under efficient medical treatment there may be a remarkable degree of recovery. Only the cells supplying some of the muscles of one arm or one leg may be involved, and in these cases recovery is still more complete. There is therefore no mystery about what we may call the pathology of the disease.

ITS CAUSE

When we come to the question of causation we must tread more warily, although still with a good deal of confidence. In 1910, Simon Flexner of the Rockefeller Institute, found that when infected material from the spinal cord of a fatal case was injected into a monkey the animal acquired the disease, and that the infecting agent, or virus as it is called, would pass through the pores of the finest filter. It belongs, therefore, to that group of the most minute germs known as the filter passers. Noguchi, the distinguished Japanese scientist of the Rockefeller Institute who recently died of yellow fever while investigating that disease on the West Coast of Africa, succeeded in making a culture of the virus, and this, when injected into monkeys, reproduces the disease in the animal. The reason the monkey is used is that no other animal appears to be susceptible. Other views have been expressed about the causal agent, but none have the convincing quality which characterizes the work of Flexner and Noguchi.

METHOD OF SPREAD

While we are on firm ground in considering the pathological changes in poliomyelitis, and are fairly certain as to the causal agent, we are still very much in the dark as to the method of spread. The general belief is that the disease is spread by contact, but it is very difficult to prove this. It has already been pointed out that the infection may be conveyed not only by those suffering from definite inflammation of the spinal cord, but also by others who may have manifested none of the ordinary signs of the disease, and even by perfectly healthy carriers. Others believe that the infection may be spread in other ways, but here, even more decidedly, there is no shadow of proof. Ignorance regarding the method of spread makes it difficult to take rational steps in the matter of prevention. The same, however, is true of other diseases, such as influenza, cerebrospinal meningitis, and sleeping sickness.

TREATMENT OF POLIOMYELITIS

With the first symptoms of the disease it is important that the child be placed at complete rest. If the patient is allowed to move about, there is danger of more damage to the nerve centres. The treatment at this time is that for an acute febrile condition, as directed by the physician. Further, immediate treatment of the disease is directed towards the prevention or, limitation of the paralysis which is the result of the action of the poliomyelitis virus on the nerve cells.

It has been found that the blood of persons who have recovered from the disease has a neutralising action on this virus. Based on this experimental evidence, individuals struck down with poliomyelitis have been treated with the serum from the blood of people who have recovered. This serum is called "convalescent serum" and has been used extensively in several previous epidemics in various centres. The evidence is that this serum, when administered quite early in the attack, has a beneficial effect in many cases.

The results indicate that occasionally it may prevent paralysis. Following the use of the serum, a lower mortality rate is noted. Moreover there is a lower average total paralysis, and a lower incidence of paralysis of the severer grades. The effectiveness of such treatment depends upon an early recognition of the condition and the use of the serum in the pre-paralytic stage of the disease. It is considered that the serum has little value once the paralysis has set in. The available supply of such serum, obviously may be limited, since it can be obtained only from those who have recovered from infantile paralysis. Antibodies to the virus which causes the disease have been found in the serum of persons who have had the disease over 30 years previously. The most valuable immune serum, however, is considered to be of the donors whose attack occurred from a few weeks to several years previously.

From what has been said it becomes evident that those who have recovered from a previous attack of the disease are in a position to confer a great public benefit by giving a comparatively small quantity of blood that is needed for the treatment of children suffering from this dread disease. The removal of this small amount of blood is without injurious effect on the person who gives it.

SYMPTOMS OF THE DISEASE

In the cases of infantile paralysis occurring in Winnipeg the most prominent initial symptom has been vomiting.

The vomiting does not necessarily accompany every case. Associated with the vomiting is a prompt rise of temperature at varying intervals from 101 to 104 degrees Fahr. The vomiting may occur only once or may be repeated at varying intervals for a period of twelve to twenty-four hours. As this is the season of the year when attacks of indigestion most commonly occur the parents frequently are not alarmed and with younger children they ease their anxiety by the fact that the child is teething. In contrast to the usual attack of indigestion diarrhoea does not follow but the child next day remains constipated the temperature remains elevated and the child still appears ill. The child may be irritable as indicated by crying or tossing about in his bed, but on the other hand he may be very drowsy taking no interest in surroundings or his food. Above all he is willing to stay in bed which is in direct contrast to his behaviour in those ordinary infections of childhood that are accompanied by vomiting and temperature. If irritable and old enough the patient may complain of headache or pain on movement of the neck, not as a rule if the neck is moved from side to side, but only if attempts are made to bend his neck forward to take a spoonful of food or for any other reason. He may refuse to sit up or if he does so, does it with difficulty, raising himself by means of his hands, at all times holding his back rigid and he will complain of pain if asked to touch his toes with his fingers while in the sitting position.

In a very few cases sore throat has been the initial complaint, but in such cases examination reveals only a slight redness, not sufficient to account for the temperature, and further examination reveals pain in the neck or in the spine on forward movement.

Whenever any of these so-called "pre-paralytic symptoms" of the disease are noticeable they should warrant an immediate consultation with the family physician, who can then institute measures to confirm the diagnosis by an examination of the spinal fluid.

A still more severe type of the disease is known as the bulbar type of infantile paralysis. The onset is very sudden, usually with vomiting and temperature. In a few hours there is noted a great difficulty in swallowing along with the usual neck signs. There may be a paralysis of one side of the face, and paralysis of one-half of the body may rapidly follow.

If the paralysis spreads to involve the muscles of breathing death rapidly follows.

It has been recognized in previous epidemics elsewhere that the use of convalescent serum not later than forty-eight hours after the onset of symptoms tends to prevent or lessen the subsequent paralysis, but once paralysis has made itself evident which usually occurs three to seven days after the onset of symptoms, treatment by the use of convalescent serum is of no avail.

There is another type of case who simply appears out of sorts, a little more irritable than usual, does not take his food well, and has temperature may be normal. In four or five days the mother notices that he does not walk well, has difficulty in going upstairs, and if laid on the floor has difficulty in rising to the standing position. Cases of this type can now be regarded as mild attacks of infantile paralysis, as evidenced by general muscular weakness. A child with such symptoms should be put at absolute rest in bed, in order to give the muscles the best opportunity to recover.

TREATMENT OF THE PARALYSIS

Treatment during the acute attack has been fully discussed in previous articles. The management of the patient in the weeks and months after the illness is over will now be considered.

The first thing to realize is that marked improvement during this period is to be expected. Little patients who have one or more limbs completely paralysed at the beginning practically always improve, and indeed may even go on to complete recovery. Although many patients are unable to walk at first it is very exceptional to see one who cannot eventually be got on his feet. It is well to remember the bright side of this all too gloomy picture and to realize that there is every reason to look hopefully to the future.

It cannot be too strongly emphasized that these children should be under constant medical or surgical supervision until they have recovered as far as possible. This means for weeks at least, more often for months and years. It is especially during the first weeks that much good can be done by proper management, but that much harm will result from neglect or from following bad advice. No attempt is made in this article to tell parents how to treat their children, but there are two very important points in the treatment that should be emphasized.

The first is that rest is the sheet anchor in the treatment. This means rest in bed. How long a period will depend upon many factors, and will be determined by the doctor in each individual case. The second is that the paralyzed limbs must be splinted in such a way as to prevent overstretching of the paralyzed muscles, and to prevent the occurrence of deformity. Again the doctor must determine the character of the splinting for each individual case.

When these two things, rest and splinting, have been instituted, nine tenths of the treatment during the first few months is arranged for. Considerations of other methods of treatment are of minor importance. The diet should be light and suited to the age of the child. No specially nourishing food is indicated; it is better for these children not to become fat. Mothers are urged to give forced feeding because the child is weak. This is a mistake. The various forms of electrical treatment may be useful at times, but the indiscriminate use of electricity in this disease has done a lot of harm in the past. There comes a time when most patients are benefitted by massage, but if begun too soon, or carried out without a full appreciation of its effect upon the individual patient, massage can do positive harm. All these accessory methods of treatment must be carefully prescribed by the doctor, and must be regarded as adjutants only of the main things which are rest and splinting of the paralyzed muscles.

—

EPIDEMIOLOGY OF INFANTILE PARALYSIS

Infantile paralysis was first established as a clinical entity by Heine of Cannstadt, in 1840. Medin, of Sweden, in 1890 was the first carefully to study an epidemic and to recognize the various types.

The first outbreak described in America was reported by Calverley in 1894 in Vermont. Wickman, of Sweden, in 1905 suggested contagion as a factor in spread.

Many epidemics have been reported in widely separated places—Italy, Norway, Sweden, Germany, France, England, Australia, New Zealand, Russia, Switzerland, Austria, Iceland, the United States and Canada have all suffered at various times and in varying degrees.

Since 1910 the disease has shown increases on the American continent. In 1916 there were 29,000 cases and 6,000 deaths in the United States. Since 1916 it would appear that the virus is widely sown. It may crop out in any region, either in outbreak form or as sporadic cases. It is a warm weather disease, but not a disease of warm countries. It is uncommon in the tropics.

It now has a worldwide distribution, but northern Europe and North America have been affected the most.

The incidence curve usually rises in July, reaches its peak in August or early September and declines rapidly with the advent of cold weather. Sometimes a few cases occur in winter. This seasonal periodicity recurs with marked regularity in all endemic centres. As a rule, the attack rate is inversely proportional to the concentration of population—that is, infantile paralysis is predominantly a disease of smaller communities and rural sections. There have been notable variations to this rule. For example, the great outbreak which occurred in New York City in 1916. Records of outbreaks show the lowest incidence in large cities, higher in small towns and highest in villages and in the country.

The disease does not appear to be influenced by social or economic conditions. It prevails under good and bad sanitary conditions. It spares neither rich nor poor, clean nor dirty, strong nor weak.

Infantile paralysis is a disorder of childhood probably because the young are more susceptible to infection. Sixty-five per cent of all cases occur under five years of age and 95 per cent under ten years. Any age, however, may be affected, not even grandfathers are entirely immune.

Infantile paralysis is a malignant disease both as regards its ability to cause death and leave its victims permanently injured. Of 38 epidemics in various parts of the world, comprising 20,568 cases, the case fatality ranged from 30.7 to 5 per cent, the average of all being 20.8. The case fatality is lowest from one to five, the age of greatest incidence of attack. It is high under one year, and becomes proportionately higher over five, as age advances. This may be more apparent than real, due to failure to recognize and report mild cases in infants and adults.

Infantile paralysis, as a rule, does not spread in families. Only 4.3 per cent of the 8,634 families affected in the New York outbreak had more than one case. When multiple cases do occur in a family, they usually come down together or within a short time of each other: this signifies infection from a common source. The situation with other diseases communicable by contact, such as measles, is just the opposite. When measles is brought into a family by one child, others exposed contract it.

One attack of infantile paralysis confers a high degree of immunity. Second attacks are said to be unknown. No racial immunity to the infection is found, although the white race has been most affected.

The mode of transmission is not definitely known, there are a number of theories as to this. The contact theory is based on the assumption that the virus is discharged from the mouth and nose and enters through the same channel. There is some evidence which might give ground for the belief that the disease is directly transmissible from person to person, and there is a suspicion that healthy carriers play a part in spreading infection. If healthy

carriers are capable of spreading the disease, it increases the difficulty of suppression. There are epidemiological features of infantile paralysis that cannot be explained on the theory of contact infection, such as seasonal prevalence, rural incidence, the lack of tendency to spread in families and the disinclination to attack congested centres or to spread in hospitals and institutions. Evidence for an insect-borne theory is that infantile paralysis has a seasonal prevalence corresponding to that of the insectborne diseases, and just opposite to the seasonal prevalence of diseases spread by contact through the secretions of the mouth and nose. Many epidemiological features suggest the possibility of an insect carrier. Up to the present no evidence has been produced which would convict any insect.

Milk and other foods have been cited as a method of transmission, but not proven to be such. It has been suggested that the virus may be air-borne, in the sense that it is carried in the dust. Animal carriers have been under suspicion. Transmission through wounds has been considered.

From our meagre knowledge of the disease the conclusion is forced upon us that infantile paralysis is one of the diseases like typhoid fever that is spread in more ways than one. This conclusion is emphasized by the epidemiological vagaries of the disease and the evidence of animal experimentation.

Prevention—No definite or effective prevention can be formulated until we are sure of the mode of transmission. Health authorities require that analogous measures be carried out to those employed in ordinary diseases known to be carried in the ways mentioned above. The Patient should be isolated for at least three weeks and screened; all discharges should be thoroughly disinfected; care should be taken that articles which may have become contaminated by the patient are disinfected or burned; persons handling the patient should take precautions regarding their hands and person, before coming in contact with other people.

Children in contact with a case in a home should be kept under observation and not return to school for at least two weeks.

During outbreaks children should be kept away from public gatherings, and prevented from using public drinking cups. Careful supervision of the food supply, particularly that of children, has been recommended.